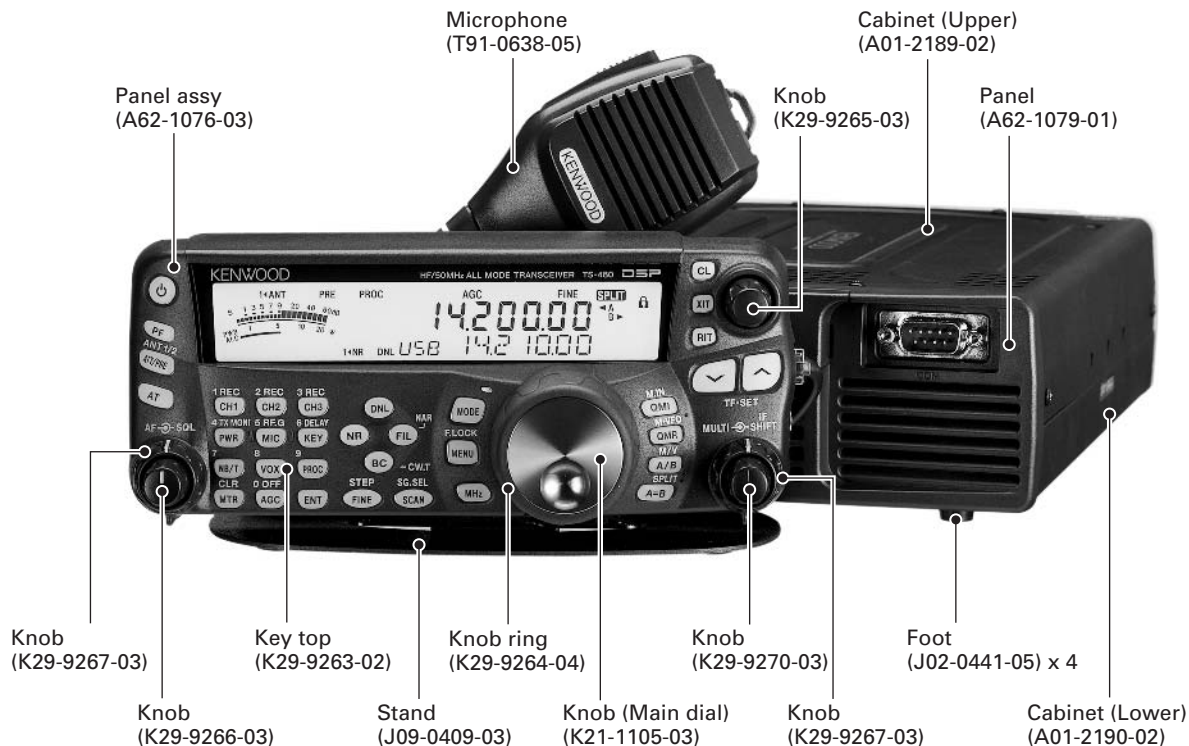


# TS-480HX/480SAT

## SERVICE MANUAL

KENWOOD

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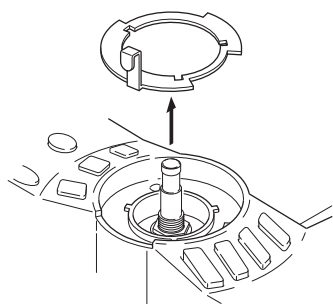
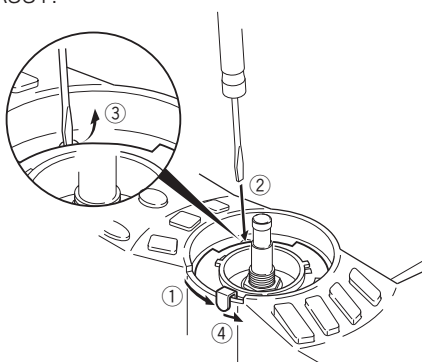
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## DISASSEMBLY FOR REPAIR

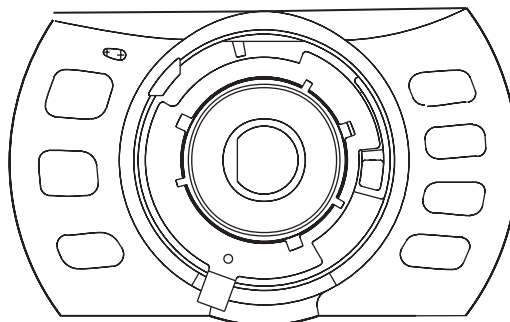
### How to remove the torque changeover lever (G02-0898-04)

1. Turn the lever section of the torque changeover lever to the right. ( ① )
2. Insert the tip of a flat-head screwdriver into the recessed part of the torque changeover lever. ( ② )
3. Lift the torque changeover lever using the tip of the flat-head screwdriver. ( ③ )  
Caution: Be careful not to damage the torque changeover lever when lifting it.
4. Turn the lever section of the torque changeover lever to the right, as in the position described in step 3. ( ④ )
5. Lift the torque changeover lever and remove it from the panel ASSY.



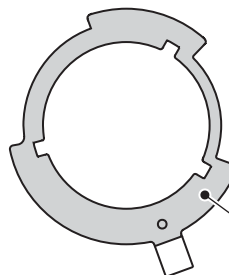
### Cautions for mounting the main dial knob (K21-1105-03)

Confirm that the lever section of the torque changeover lever is in the fully turned left position (Torque OFF) before mounting the main dial knob.



### Cautions for replacing the torque changeover lever

Apply the dry-surf 2400 onto the front and rear surfaces after replacing the torque changeover lever. (Do not apply the dry surf to the lever section.)



Apply the dry-surf 2400 onto the front and rear surfaces of the torque changeover lever.

### How to mount the torque changeover lever (G02-0898-04)

1. Insert the torque changeover lever into the mounting location so that the three tabs align with the torque changeover slots. (Fig.1)
2. Turn the lever section of the torque changeover lever to the left while pressing the surface of the lever as shown in the Fig. 2, and mount it onto the panel ASSY.

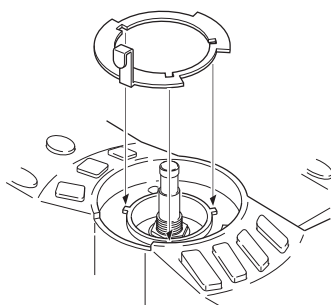


Fig. 1

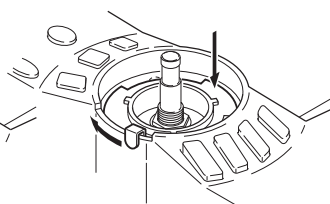


Fig. 2

# TS-480HX/480SAT

## CIRCUIT DESCRIPTION

### Frequency Configuration

Figure 1 shows the frequency configuration of this transceiver. All modes operate in a double conversion while transmitting. FM mode operates in a triple conversion and other modes operate in a double conversion while receiving.

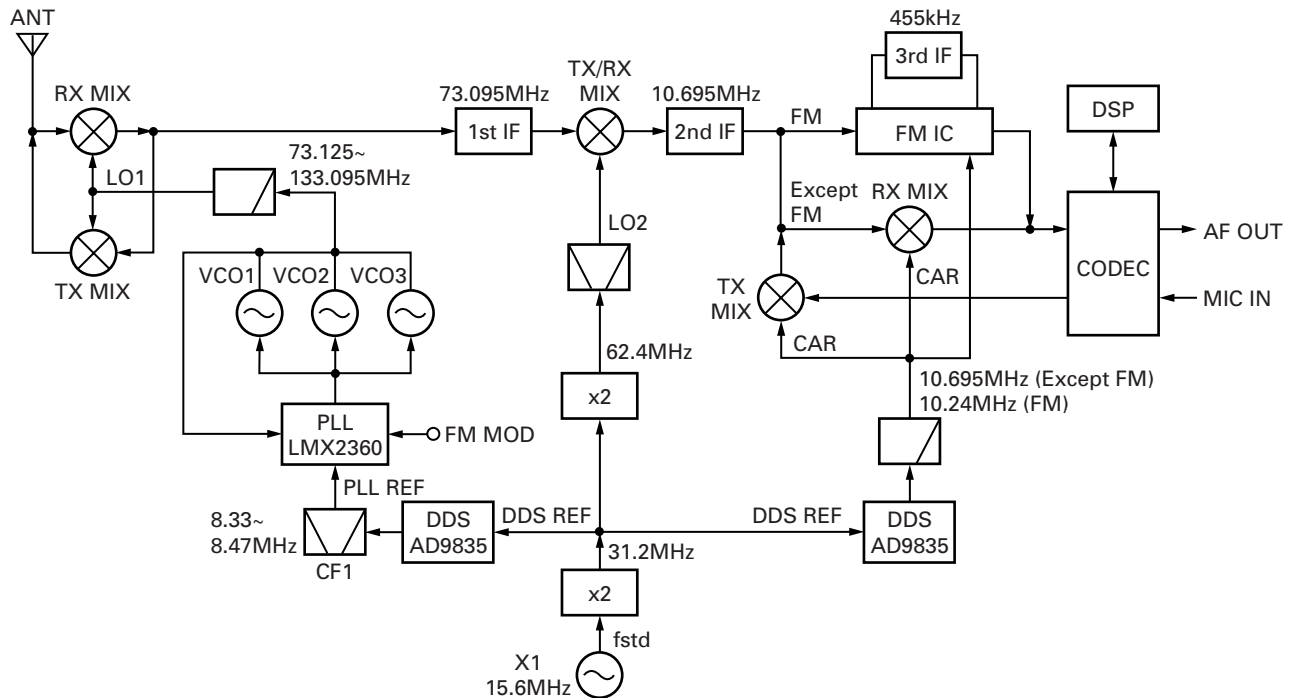


Fig. 1 Frequency configuration

### Reference Signal Generator

The reference frequency (fstd), which is used to control the PLL frequency, oscillates at 15.6MHz in a crystal oscillation circuit (X1, Q1). This 15.6MHz signal passes through a buffer amplifier (Q4) and is doubled in a multiplier (Q5) to generate a 31.2 MHz signal. The 31.2MHz signal is used as the reference signal for the DDS (IC1) for the PLL reference signal of the first local oscillator (LO1) and the DDS (IC2) for a carrier (CAR).

The SO-3 (TCXO unit) is configured as an option in this transceiver, so that you can replace the crystal oscillation circuit (X1, Q1) with the SO-3. However, you must cut the R103 (0Ω) and R104 (0Ω) jumper wires to stop the operation of the crystal oscillation circuit (X1, Q1) when using the SO-3.

### LO1/LO2/CAR

#### ■ LO1 (the 1st local oscillator)

A frequency between 8.33MHz and 8.47MHz is output using the 31.2MHz signal as the reference signal in the DDS (IC1). The output signal passes through a ceramic filter (CF1) and enters into a PLL (IC3). This signal is divided into 1/8 (1/R) in the PLL and becomes the comparison frequency  $f_0$  for the frequency between 1.041MHz and 1.058MHz.

The VCOs (Q451, Q452, Q456) of LO1 oscillate between

73.125MHz and 133.095MHz. The oscillation output of these VCOs enter pin 6 of the PLL (IC3), then divides into 1/N in the PLL. The comparison frequency  $f_0$  is compared with the frequency divided into 1/N by a phase comparator in the PLL, then locks the frequency to use it as the output frequency of LO1.

In the DDS (IC1), the output frequency (8.33MHz to 8.47MHz) is swept with  $f_{DDS\ STEP} [Hz] = 10 \times R/N$  when the step is 10Hz or  $f_{DDS\ STEP} [Hz] = 1 \times R/N$  when the step is 1Hz. Therefore, LO1 covers the frequency range of 73.125MHz to 133.095MHz with 10Hz or 1Hz steps.

The PLL output generated by the above-mentioned method is amplified at Q15 and passes through a band-pass filter with a cutoff switching circuit, an attenuator, and a low-pass filter, and is then sent to the RF unit (X44-327) as LO1.

#### ■ LO2 (the 2nd local oscillator)

The 15.6MHz (reference frequency) signal passes through a buffer amplifier (Q4) and is doubled in a multiplier (Q5) to generate a 31.2MHz signal. The resistance of the 31.2MHz signal is distributed since it is used as the reference signal for each DDS (IC1, IC2). The 31.2MHz signal is doubled in a multiplier (Q8, Q12) to generate a 62.4MHz signal.

The band-pass filter cuts the high harmonic of the 62.4MHz signal and the signal is sent to the RF unit (X44-327) as LO2.

# TS-480HX/480SAT

## CIRCUIT DESCRIPTION

### ■ CAR (carrier)

The 10.695MHz used in the local oscillation and detection is generated by the DDS (IC2). The output signal sent from this DDS passes through a buffer amplifier (Q10) and a low-pass filter, and is then sent to each signal.

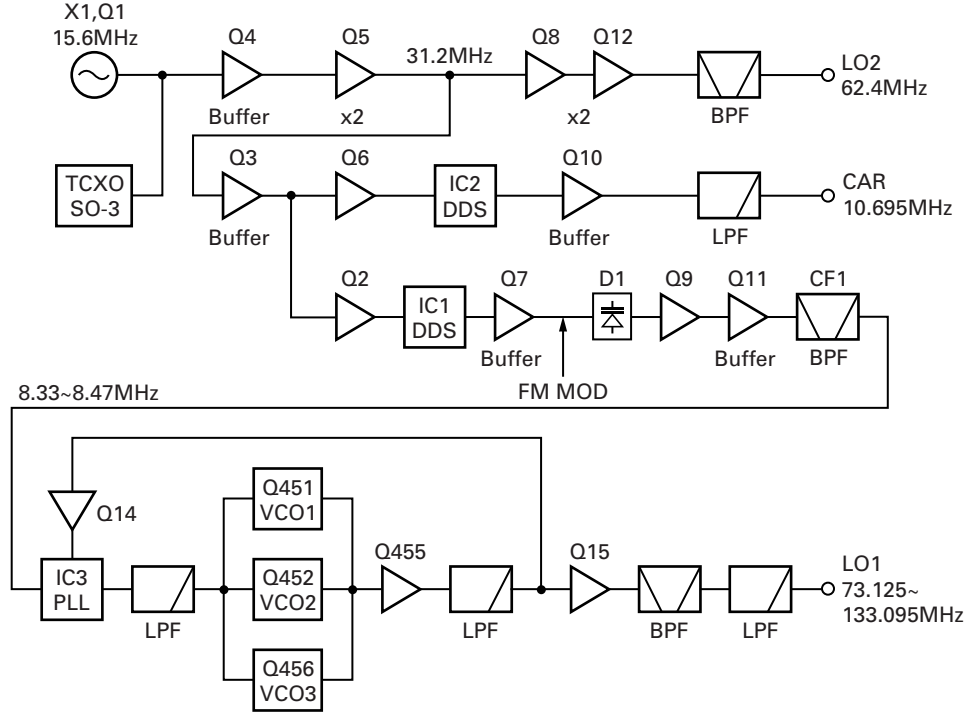


Fig. 2 Reference signal generator, LO1/LO2/CAR

DDS AD9835BRU (IC1)										
HF TX/RX	USB		LSB		CW		CW-R		CWN	
Lo1	RX	TX	RX	TX	RX	TX	RX	TX	RX	TX
Filter offset 1	+1.5k	+1.5k	-1.5k	-1.5k	+(1.5k-PITCH)	+(1.5k-PITCH)	-(1.5k-PITCH)	-(1.5k-PITCH)	0	0
Filter offset 2	+0.71k	+0.71k	-0.71k	-0.71k	-	-	-	-	-	-
RIT	(Δ RIT)	-	(Δ RIT)	-	(Δ RIT)	-	(Δ RIT)	-	(Δ RIT)	-
XIT	-	(Δ XIT)	-	(Δ XIT)	-	(Δ XIT)	-	(Δ XIT)	-	(Δ XIT)
IF Shift	+(IF S)	-	-(IF S)	-	+(IF S)	-	-(IF S)	-	+(IF S)	-
CAR correction	+(CAR H)	+(CAR H)	-(CAR L)	-(CAR L)	+(CAR H)	+(CAR H)	-(CAR L)	-(CAR L)	-	-
HF TX/RX	CWN-R		FSK		FSK-R		AM		FM	
Lo1	RX	TX	RX	TX	RX	TX	RX	TX	RX	TX
Filter offset 1	0	0	-(SHIFT/2)	-(SHIFT/2)	-(SHIFT/2)	-(SHIFT/2)	0	0	0	0
Filter offset 2	-	-	-	-	-	-	-	-	-	-
RIT	(Δ RIT)	-	(Δ RIT)	-	(Δ RIT)	-	(Δ RIT)	-	(Δ RIT)	-
XIT	-	(Δ XIT)	-	(Δ XIT)	-	(Δ XIT)	-	(Δ XIT)	-	(Δ XIT)
IF Shift	-(IF S)	-	-(IF S)	-	+(IF S)	-	-	-	-	-
CAR correction	-	-	-	-	-	-	-	-	-	-

Filter offset 2 : DATA filter ON, The amount of IF shift when selecting Center "2210Hz"

(Δ RIT) : RIT frequency variable amount (-9.99~+9.99kHz)

(Δ XIT) : XIT frequency variable amount (-9.99~+9.99kHz)

(PITCH) : CW pitch frequency (400~1000Hz, Initial value 800Hz)

(SHIFT) : FSK shift width frequency (170Hz, 200Hz, 425Hz, 850Hz, Initial value:170Hz)

(MARK) : FSK mark frequency (H TONE : 2125Hz, L TONE : 1275Hz, Initial value : 2125Hz)

Table 1 LO1 frequency shift data

# TS-480HX/480SAT

## CIRCUIT DESCRIPTION

DDS AD9835BRU (IC2)										
CAR	USB		LSB		CW		CW-R		CWN	
	RX	TX	RX	TX	RX	TX	RX	TX	RX	TX
Filter offset 1	+1.5k	+1.5k	-1.5k	-1.5k	+(1.5k-PITCH)	+(1.5k-PITCH)	-(1.5k-PITCH)	-(1.5k-PITCH)	0	0
Filter offset 2	+0.71k	+0.71k	-0.71k	-0.71k	-	-	-	-	-	-
CW pitch	-	-	-	-	+(PIITCH)	-	-(PIITCH)	-	+(PIITCH)	-
FSK tone	-	-	-	-	-	-	-	-	-	-
IF Shift	+(IF S)	-	-(IF S)	-	+(IF S)	-	-(IF S)	-	+(IF S)	-
CAR correction	+(CAR H)	+(CAR H)	-(CAR L)	-(CAR L)	+(CAR H)	+(CAR H)	-(CAR L)	-(CAR L)	-	-
CAR	CWN-R		FSK		FSK-R		AM		FM	
	RX	TX	RX	TX	RX	TX	RX	TX	RX	TX
Filter offset 1	0	0	-(SHIFT/2)	-(SHIFT/2)	-(SHIFT/2)	-(SHIFT/2)	Stop	0	-455k	0
Filter offset 2	-	-	-	-	-	-	-	-	-	-
CW pitch	-(PIITCH)	-	-	-	-	-	-	-	-	-
FSK tone	-	-	-(MARK)	-(MARK)	+(MARK+SHIFT)	-(MARK)	-	-	-	-
IF Shift	-(IF S)	-	-(IF S)	-	+(IF S)	-	-	-	-	-
CAR correction	-	-	-	-	-	-	-	-	-	-

Filter offset 2 : DATA filter ON, The amount of IF shift when selecting Center "2210Hz"

(Δ RIT) : RIT frequency variable amount (-9.99~+9.99kHz)

(Δ XIT) : XIT frequency variable amount (-9.99~+9.99kHz)

(PITCH) : CW pitch frequency (400~1000Hz, Initial value 800Hz)

(SHIFT) : FSK shift width frequency (170Hz, 200Hz, 425Hz, 850Hz, Initial value:170Hz)

(MARK) : FSK mark frequency (H TONE : 2125Hz, L TONE : 1275Hz, Initial value : 2125Hz)

**Table 2 CAR frequency shift data**

### Receiver Circuit

FM mode operates in a triple conversion: the first IF (73.095MHz), the second IF (10.695MHz), and the third IF (455kHz). All modes other than FM mode operate in a double conversion: the first IF (73.095MHz), and the second IF (10.695MHz).

#### ■ From antenna to a preamplifier (Q153, 154)

There are two antenna terminals: ANT 1 and ANT 2. With these antenna terminals, it is possible to select the terminal to be used and store the selection for each band. A pigtail wire is used in this transceiver to maintain the freedom of the antenna wire when it is mounted in a car.

The receive signal sent from the antenna terminal enters the ANT section (X45-366 C/3 : 200W transceiver, X45-365 C/3 : 100W transceiver) of the final unit. The signal passes through a surge trap, the antenna changeover relay, the antenna tuner changeover relay (only 100W transceiver), the transmission/reception changeover relay, and an image filter, and is then sent from CN503 to CN2 of the RF unit (X44-327) through a co-axial cable.

The signal input into the RF unit passes through the attenuator circuit, the image filter, the surge absorption limiter, and then enters the RF BPF. Although the default of the attenuator is 12dB, it can change to approximately 20dB by removing the CN4 jumper.

The RF BPF divides in the range as shown in table 3. The transmit signal also passes through the RF BPF when transmitting.

The preamplifier (Q153, 154) receives the signal passed through the RF BPF. This transceiver obtains necessary gain and frequency characteristic by applying NFB (Negative Feedback) to the source earthed circuit having two parallel-connected MOS FETs. Although the preamplifier was conventionally switched by switching between low-band and high-band, this transceiver can obtain necessary characteristics for each band by switching the NFB amount of the source at Q155.

You can turn the preamplifier ON/OFF by pressing the [ATT/PRE] key.

Band	Filter range
BC	30kHz~1.705MHz
1.8MHz	1.705~2.5MHz
3.5MHz	2.5~4.1MHz
7MHz	4.1~7.5MHz
10MHz	7.5~10.5MHz
14MHz	10.5~14.5MHz
21MHz	14.5~21.5MHz
28MHz	21.5~30MHz
	30~49MHz, 54~60MHz
50MHz	49~54MHz

**Table 3 RF BPF**

## CIRCUIT DESCRIPTION

### ■ From receiving 1st mixer to the second IF frequency (10.695MHz)

The output signal sent from the RF BPF passes through the image filter and is converted to the first IF frequency (73.095MHz) at the first receiving mixer (Q156, 157, 160, 161). The receiving first mixer has a circuit having quadruple JFETs (Q156, 157, 160, 161). This same type of circuit is used in high-class transceivers. Therefore, this transceiver has the same or higher dynamic characteristics as high-class transceivers.

Two MCF (XF151) with 2-poles are used in the next stage. This transceiver reduces proximity spurious components of

the transmit signal by passing the narrow-band MCF. It also reduces spurious components of the receive signal.

TP1 (CN152) and TP2 (CN252) adjust MCF. The signal passed through the MCF is amplified at the first IF amplifier (Q253) and converted to the second IF frequency (10.695 MHz) at the second receiving mixer (D256). The receiving second mixer is the passive type mixer using diodes and the transmit signal passes through it when performing transmission.

The second IF signal (10.695MHz) is sent from CN254 of the RF unit (X44-327) to CN501 of the TX-RX unit (X57-663 A/2) through a co-axial cable.

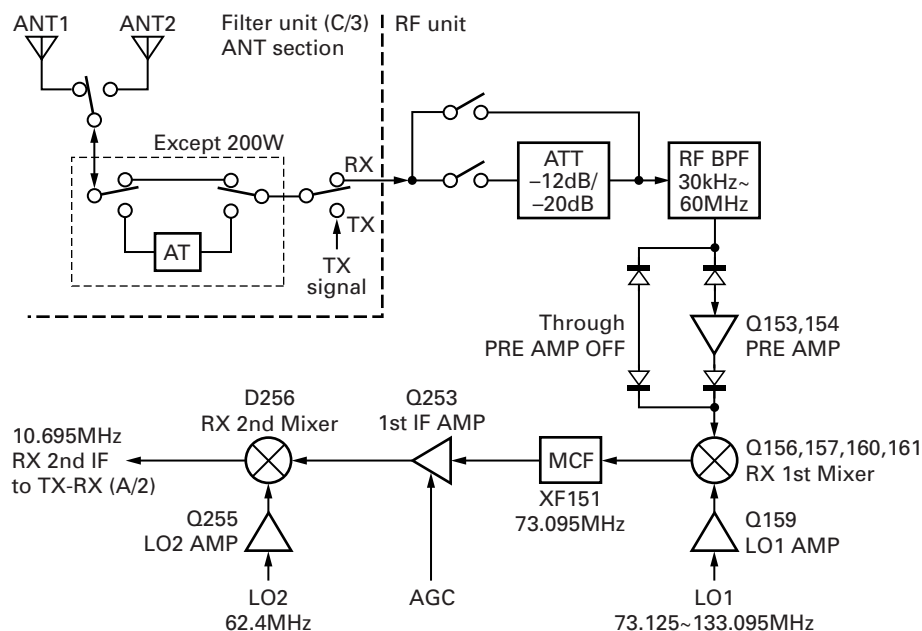


Fig. 3 From antenna to the second IF frequency (10.695MHz)

### ■ 10.695MHz IF filter circuit (Filter section (X57-663 B/2) of the TX-RX unit)

The TX-RX unit (X57-663 A/2) comprises the receiver circuit, the PLL circuit, the transmitter circuit (from AF to the first IF: 10.695MHz), the AF DSP, and the control circuit.

The second IF signal (10.695 MHz) input into CN501 of the TX-RX unit (X57-663 A/2) enters CN901 of the filter section (X57-663 B/2). This unit has the 10.695MHz IF filter and the IF amplifier. It is possible to remove the unit to mount a optional IF filter (two pieces) and TCXO (SO-3).

The second IF signal (10.695MHz) input from CN901 is amplified at the second receiver IF amplifier (Q901). The second receiver IF amplifier operates as a gate of the noise blanker. Q902 and Q901 turn OFF while blanking. Q901 amplifies the transmit signal.

The output signal sent from Q901 passes through the 10.695MHz IF filter and is amplified at the IF amplifier (Q971), then returns to the TX-RX unit (X57-663 A/2) from CN971.

Table 4 shows the path of the 10.695MHz IF filter mode.

You can mount two IF filters from the following optional IF filter types:

SSB NARROW: 1.8kHz, CW: 500Hz, and CW NARROW: 270Hz.

The option filter is automatically selected by the resistance, which is set in the option filter. Therefore, you do not need to select the filter using menu or a switch.

Filter	Bandwidth	RX	TX
Through (R943, 945)	Through	FM	Not used
XF931	6kHz	AM	AM
XF932	2.4kHz	SSB/CW/FSK /AM NAR	SSB/CW/FSK /FM
Option filter 1	*1	*2	Not used
Option filter 2	*1	*2	Not used

\*1: The bandwidth of the mounted IF filter is applied.

\*2: The mode changes corresponding to the mounted IF filter.

The CW filter is available in SSB mode with the selection is in the menu.

Table 4 IF filter selection

## CIRCUIT DESCRIPTION

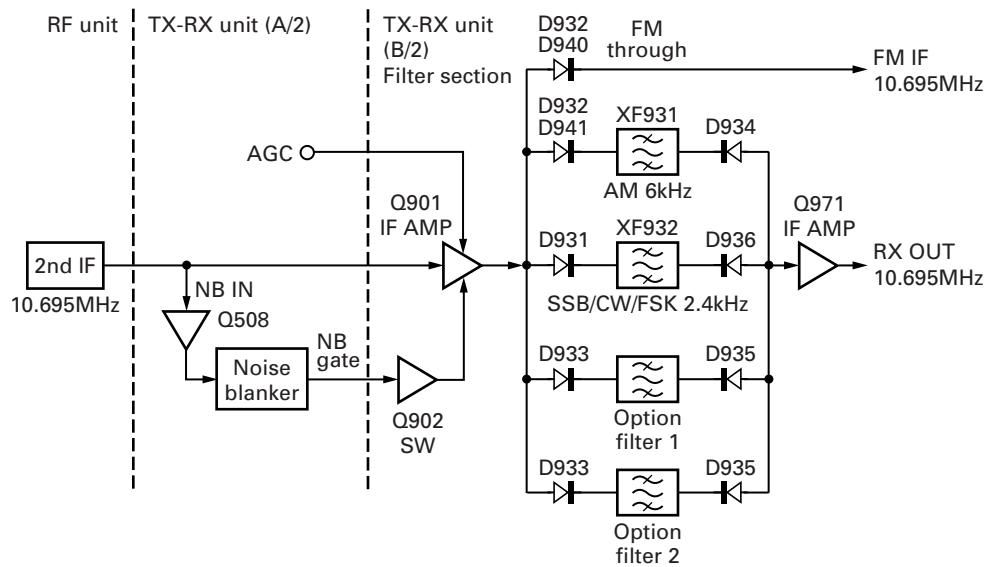


Fig. 4 10.695MHz IF filter circuit

### ■ From the receiver second IF to detection (TX-RX unit (X57-663 A/2))

The path of the second IF signal (10.695MHz) input into CN555 of the TX-RX unit (X57-663 A/2) is different between FM mode and all other modes until the detection stage.

In modes other than FM mode, the second IF signal is amplified at Q551 and Q554. The diode located at the second side of the loading side coil (L553) of Q551 is a PIN diode (D551). With the current applied to the PIN diode, the receiving total gain, which is used to start the AGC operation, is determined in modes other than FM mode. It is possible to change the current with adjustment menu No.1 (AGC Ref.).

The transistor (Q561) connected to the source of Q554 is used as a switch to mute the IF signals in modes other than FM mode while transmitting.

The signal amplified at Q554 is detected at the mixer IC (IC553) and becomes the AF signal in SSB/ CW/ FSK mode.

In AM mode, the signal amplified at Q554 passes through Q556 and is detected at D555. Some DC bias is applied to D555 to reduce distortion of small signals. The output signal D552 sent from Q556 is rectified at D552 and the AGC voltage is generated by Q552.

In FM mode, the second IF signal enters into the FM IC (IC551). The entered signal is converted to 455kHz. The signal is then amplified at the limiter circuit in the FM IC, where it is detected.

Although the receive bandwidth in FM mode is decided by the ceramic filter (CF551), the bandwidth of the filter does not change in FM Narrow mode.

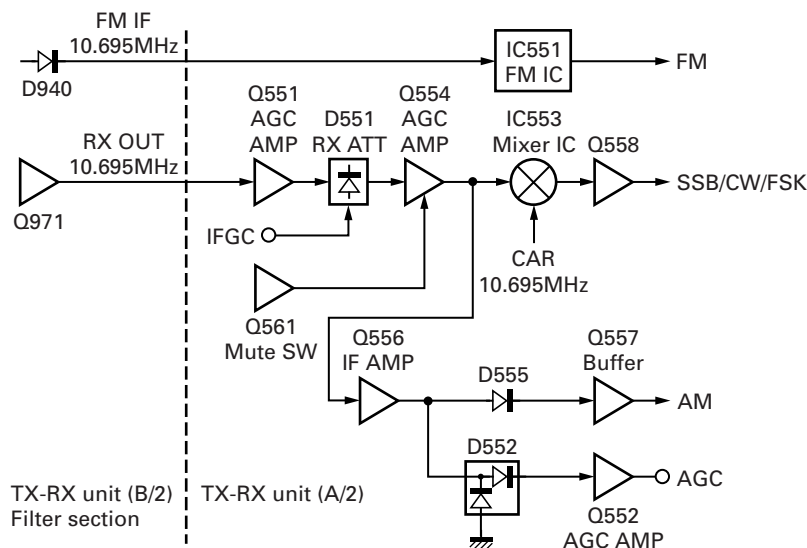


Fig. 5 From the receiver second IF to detection



## CIRCUIT DESCRIPTION

### ■ From detection to AF output

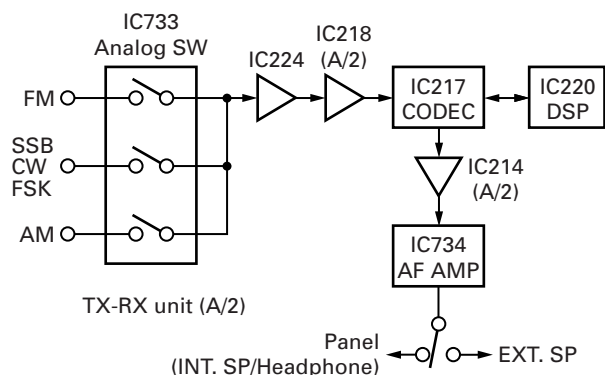
As for the AF signal detected in each mode, a necessary mode for the signal is selected by the analog switch (IC733). The AF signal is amplified at IC224 and IC218 and converted to a digital signal by the CODEC (IC217), and is then sent to the DSP (IC220).

In the DSP, the basic signal processing such as AF gain, the interference elimination such as slope tune, and the noise reduction such as NR are performed for the signal. The signal is then converted to an analog signal again at the CODEC.

The analog signal is amplified at IC214, then re-amplified at the AF amplifier (IC734) to drive the speaker.

To utilize the convenience of the "completely separated panel type", the internal speaker and the headphone terminal is mounted in the panel and the external speaker terminal is mounted in the transceiver.

To realize the priority of the received audio output (the headphone (top priority), the external speaker (the second priority), and the internal speaker (the third priority)), use the headphone and the external speaker jack having a switch to make each MCU (X54 IC3, X57 IC204) recognize the condition of the inserted plug and switch the relay set on the output of the AF amplifier (IC734) in order to select an appropriate path.



**Fig. 6 From detection to AF output**

### Transmitter Circuit

There are two types of transmission output: 200W (TS-480HX) and 100W (TS-480SAT). The 100 W transceiver has an internal antenna tuner.

With the presence of the internal antenna tuner, the final section (A/3), the LPF section (B/3), and the ANT section (C/3) of the final unit is different between the 200 W transceiver and the 100W transceiver (200W transceiver: X45-366, 100W transceiver: X45-365). The same type of the TX-RX unit (X57-663) and RF unit (X44-327) are used in both the 200W transceiver and the 100W transceiver, even though there is a small constant difference.

In addition, the same type of display unit (X54-341) is used in both the 200W transceiver and the 100W transceiver.

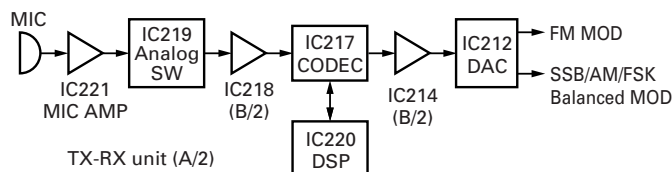
### ■ From the MIC terminal to modulation output

The frequency configuration of the transmitting part is double superheterodyne: the transmitter first IF (10.695MHz) and the transmitter second IF (73.095MHz). The same type 16-bit DSP as the receiver circuit is used in the audio signal processing stage.

The MIC terminal is mounted in the transceiver and a modular jack is also employed. This is the first time an HF transceiver to has had a modular jack.

The AF signal input from the MIC terminal is amplified at the microphone amplifier (IC221) and passes through the analog switch (IC219), where it is amplified again at IC218. The AF signal is converted to a digital signal by the CODEC (IC217), and is then sent to the DSP (IC220).

In the DSP, the MIC gain, the processor, and various filtering are performed for the signal and it is converted to an analog signal by the CODEC. The analog signal is amplified at IC214 and assigned to FM mode or a mode other than FM mode by the DAC: IC212 (used as the electrical volume), and is then sent to each modulation circuit.



**Fig. 7 From the MIC terminal to modulation output**

### Signal Path Before/ After the CODEC

The signal path changes corresponding to the transmission/reception since the CODEC exchanges the signal with the optional unit (VGS-1).

### ■ Functions relating to transmission

#### 1) Modulation input path

The output signal sent from the analog switch (IC219) enters the CODEC, and is then sent to the DSP (IC220).

- The signal sent from the microphone is output from pin 11 to pin 10 of the analog switch.
- The signal sent from the data terminal (ANI) is output from pin 1 to pin 2 of the analog switch.
- The message output signal (DRO) sent from the optional unit (VGS-1) is output from pin 4 to pin 3 of the analog switch.

#### 2) Modulation output path

The AF signal processed at the DSP (IC220) enters the CODEC (IC217) again and is amplified at IC214. The signal amplified at IC214 passes through the following signal paths in FM mode and SSB/ AM/ FSK mode. (The MIC gain is decided at the DSP, not DAC (IC212), in both modes.)

- FM mode  
The signal enters pin 21 of the DAC, and is then sent from pin 22 to the FM modulation circuit (FMOD).
- SSB/ AM/ FSK mode  
The signal enters pin 24 of the DAC, and is then sent from pin 23 to the balanced modulation circuit (SMOD).



# TS-480HX/480SAT

## CIRCUIT DESCRIPTION

### 3) Recording a message

The signal sent from the microphone is output from pin 11 to pin 10 of the analog switch (IC219), where it enters into the CODEC (IC217). The signal sent from the CODEC enters pin 13 of the DAC (IC212), and is then sent from pin 14 to the optional unit (VGS-1) to be recorded.

### ■ Constant received audio recording function

#### 1) Recording

A part of the received audio signal is sent from the CODEC (IC217) to pin 13 of the DAC (IC212), and is then sent from pin 14 of the DAC to the optional unit (VGS-1) to be recorded. The recording level is automatically compensated to become constant and you cannot randomly change the level.

### 2) Playback

The output signal (VOI) sent from the optional unit (VGS-1) passes from pin 1 to pin 2 of the DAC. The signal passes from pin 8 to pin 9 of the analog switch (IC219), and is then mixed with the input signal of the AF amplifier (IC734). The DAC (IC212) controls the volume.

### ■ Other functions

#### 1) Playing a message (monitor)

The output signal (VOI) sent from the optional unit (VGS-1) passes from pin 1 to pin 2 of the DAC. The signal passes from pin 8 to pin 9 of the analog switch (IC219), and is then mixed with the input signal of the AF amplifier (IC734). The DAC (IC212) controls the volume.

#### 2) Playing a pre-recorded voice message

The above-mentioned signal path is also used for playing a pre-recorded voice message.

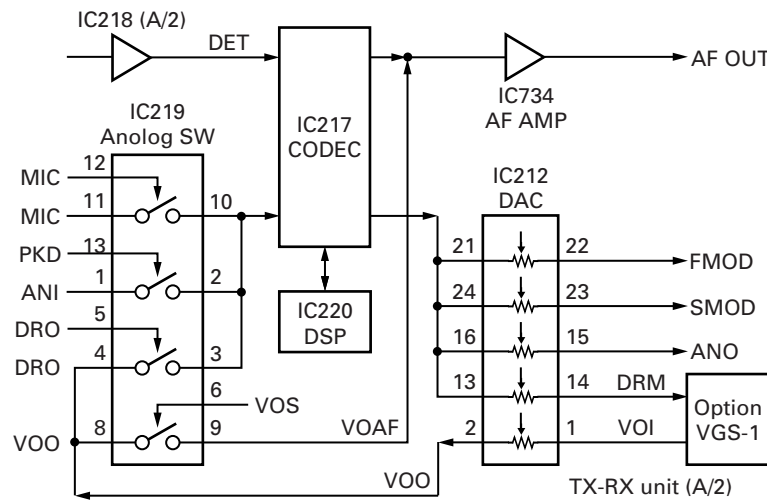


Fig. 8 Signal path before/after the CODEC

## Modulation Circuit

The modulation signal processed at the DSP is sent to the modulation circuit. The circuit receiving the modulation signal is different between FM mode and SSB/ AM/ FSK mode.

### 1) SSB/ AM/ FSK mode

The modulation signal sent from the DAC (IC212) enters the balanced modulator (IC621) after inverting the phase at Q625. The 10.695MHz transmission signal sent from the balanced modulator is amplified at Q621 and is then sent to the next stage.

#### • AM mode

The DC voltage is applied to the pin 1 of the balanced modulator via D624. With the DC voltage, the AM carrier is generated since the balanced modulator becomes unbalanced.

#### • FSK mode

In conventional FSK mode, the frequency of the carrier was changed with the external keying signal. This trans-

ceiver generates the FSK signal by changing the single tone (AF) generated at the DSP. The balanced modulator performs the same operation as SSB mode.

#### • CW/FM mode

The necessary carrier wave is obtained by making the balanced modulator lose balance.

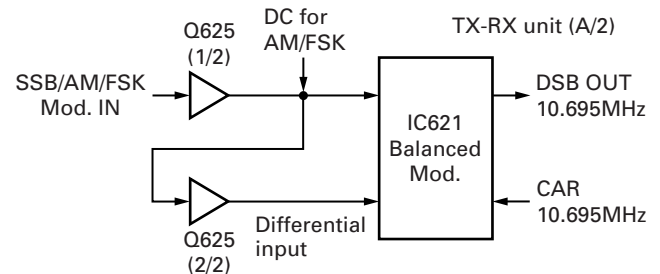


Fig. 9 SSB/AM/FSK mode modulation circuit

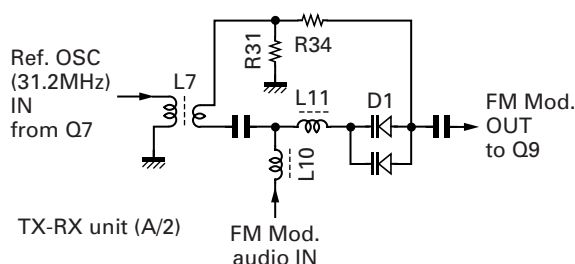
## CIRCUIT DESCRIPTION

### 2) FM mode

Although the circuit directly modulating the frequency of the VCO and the crystal oscillator was conventionally used, this transceiver uses a phase modulation circuit.

Set the variable capacity diode (D1) on the output of the DDS (IC1) working as the source of the reference frequency of the PLL circuit generating the first local oscillator (LO1). Some DC fixed bias is applied to the variable capacity diode (D1) in order to optimise the modulation sensitivity.

Although LO2 or the crystal oscillator (10.695MHz) is modulated in the conventional transceiver, the first local oscillator (LO1) is modulated in this transceiver.



**Fig. 10 FM mode modulation circuit**

### ■ From the modulation circuit to 10.695MHz

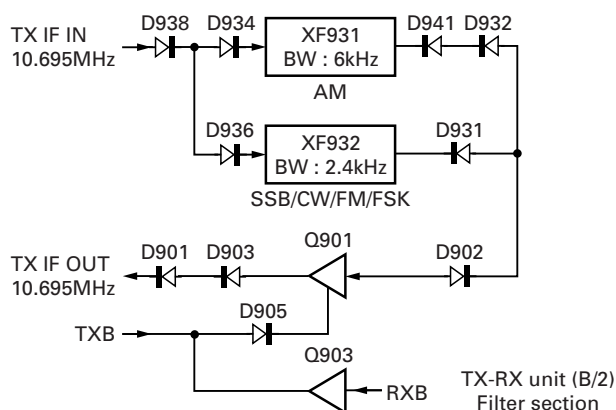
The transmission signal sent from the balanced modulator (IC621) is sent from the filter section (X57-663 B/2) of the TX-RX unit to the TXIN terminal (pin 8) of CN555. It is possible to remove the unit to mount an optional IF filter and TCXO. You can mount two optional IF filters. The IF transmit signal passes through the XF931 (passband: 6kHz) in AM mode and XF932 (passband: 2.4kHz) in modes other than AM mode.

Although various IF filters can be selected, corresponding to the passband and mode when receiving, the IF filter is automatically selected by mode when transmitting. The transmit signal passes through the 10.695MHz IF filter, is amplified at the IF amplifier (Q901), and is then sent to the IFIN terminal (pin 10) of CN554 of the TX-RX unit (A/2).

The IF amplifier (Q901) performs the gain varying operation with the ALC voltage while transmitting. The ALC voltage controls gate 2 of Q901 and the AGC voltage is applied to gate 2 while receiving. The bias voltage transferred from D905 is provided to the source of Q901 while transmitting. Q903 turns ON while receiving and it discharges TXB voltage.

The transmit signal sent from the IF amplifier (Q901) passes through D903 and D901. While D903 turns ON when transmitting, D901 makes the attenuator operate by changing the impedance with the IFGC voltage which changes the IF transmit signal. The level variance works as the TGC function controlling the transmit gain.

The 10.695MHz transmit IF signal returned from the IFIN terminal (pin 10) of CN901 of the TX-RX unit (B/2) to the TX-RX unit (A/2) is sent from CN501 of the TX-RX unit (A/2) to CN254 of the RF unit (X44-327) through a co-axial cable.



**Fig. 11 From the modulation circuit to 10.695MHz**

### ■ From 10.695MHz to the drive output

The 10.695MHz transmit IF signal input into CN254 of the RF unit (X44-327) is converted to the transmit frequency in LO1 and LO2 and sent from CN1 to the final unit (A/3) as a drive output.

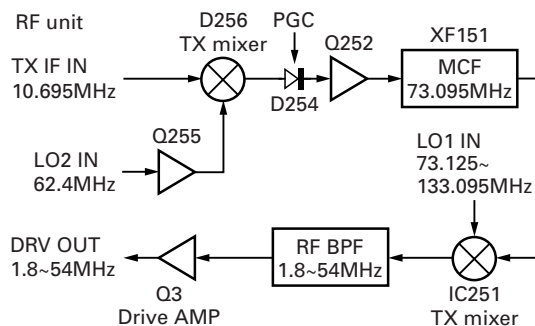
The 10.695MHz transmit IF signal is converted to 73.095 MHz by LO2 (62.4MHz:  $4 \times 15.6\text{MHz}$  (the reference frequency)) using the transmit mixer (D256). The D256 operates as a RX mixer while receiving mode.

The converted signal passes through D254 and is amplified at the IF amplifier (Q252). D254 can change the level of the 73.095 MHz transmit IF signal by changing the impedance with the current corresponding to the PGC voltage. The level variance compensates the gain of the transmit signal when performing the power control.

The 73.095MHz transmit signal passes through the MCF (XF151) and is converted to the desired transmit frequency by LO1 in the final transmit mixer (IC251). This transceiver can reduce proximity spurious components since the signal passes through the MCF (passband: approximately 15kHz) when transmitting.

The signal sent from the final transmit mixer passes through the RF BPF and is amplified at the drive amplifier (Q3) to drive the final stage, and is then sent from CN1 to the final unit (A/3).

Many spurious components can be seen when the drive output signal is analysed with the spectrum analyser. This problem occurs when the transceiver is not properly adjusted or the gain balance is not normal (when the input level to the final transmit mixer (IC251) compensating the lack of gain of the final stage is excessively high).



**Fig. 12 From 10.695MHz to the drive output**

## CIRCUIT DESCRIPTION

### ■ From the drive output to antenna

The transmit signal sent from CN1 of the RF unit (X44-327) to the final unit (A/3) is amplified to the predetermined power in the final stage and passes through the LPF. It is then output from the antenna terminal. The 100W transceiver has an internal relay type antenna tuner operating in all bands.

#### 1) 100W transceiver

The transmit signal input into CN1 of the final unit (X45-365 A/3) is amplified at the pre-drive amplifier (Q1, Q2) and the drive amplifier (Q1, Q2) in the sub unit (X58-490) and the final amplifier (Q4, Q5).

The signal is sent from CN11 to CN102 of the final unit LPF section (X45-365 B/3) using the co-axial cable to eliminate high harmonic using the predetermined low pass filter, and is then sent to the ANT section (X45-365 C/3) of the final unit through a jumper wire. This ANT section has the forward wave, reflected wave of detection circuit, the current for the

antenna tuner, the voltage detection circuit, the IN/THROUGH changeover relay of the antenna tuner, transmission/ reception changeover relay, and the antenna changeover relay, and obtains the transmit output from ANT1 or ANT2.

The antenna tuner has the LC tuning circuit in the final unit (X45-365 A/3) and the detection/ control circuit in the ANT section (X45-365 C/3) of the final unit. The operation is the same as the conventional transceiver. The phase difference signal of IC503 in the ANT part switches the condenser in the input side of the final unit tuning circuit and the amplitude difference signal of IC502 switches the condenser in the output side.

The SWR is decided by calculating the voltage of the forward wave and the reflected wave with the MCU (IC204). The voltage of the forward wave and the reflected wave are used for controlling the power, the power meter, and the SWR protection.

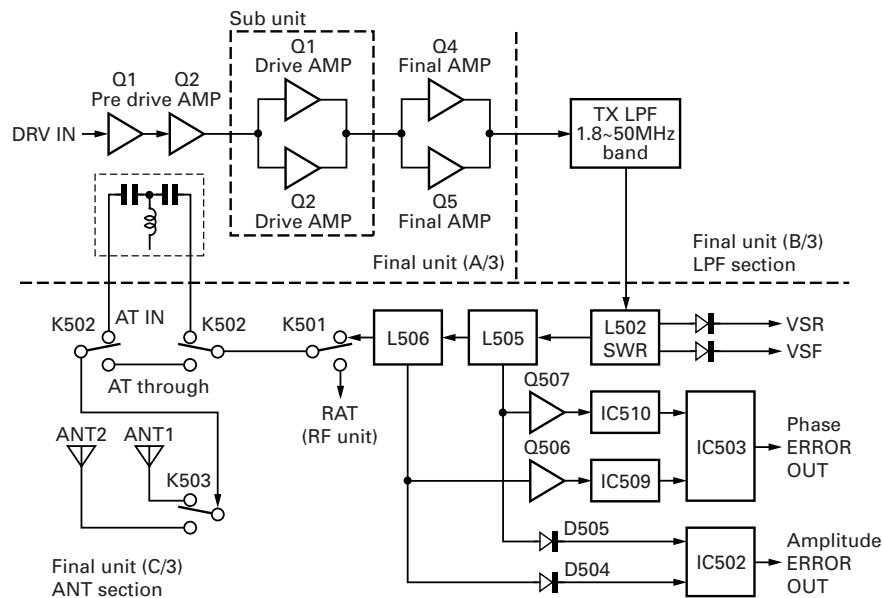


Fig. 13 From the drive output to antenna (100W)

#### 2) 200W transceiver

The 200W transceiver has almost the same circuit configuration as the 100W transceiver to the drive stage.

To obtain 200W of electrical power, it has two 100W final circuits and synthesizes electricity produced by the circuit. In the actual circuit, the L802 splitter divides the drive output of the sub unit (X58-490) into two final circuits. L818 synthesizes the produced outputs and L820 performs the impedance conversion to obtain approximately 50Ω. Although the paths of the following steps are the same as the 100W type, it does not have an antenna tuner.

Although the HF band of the transmit output is 200W, 100W is used for the 50MHz band by considering the heat loss due to the downsizing.

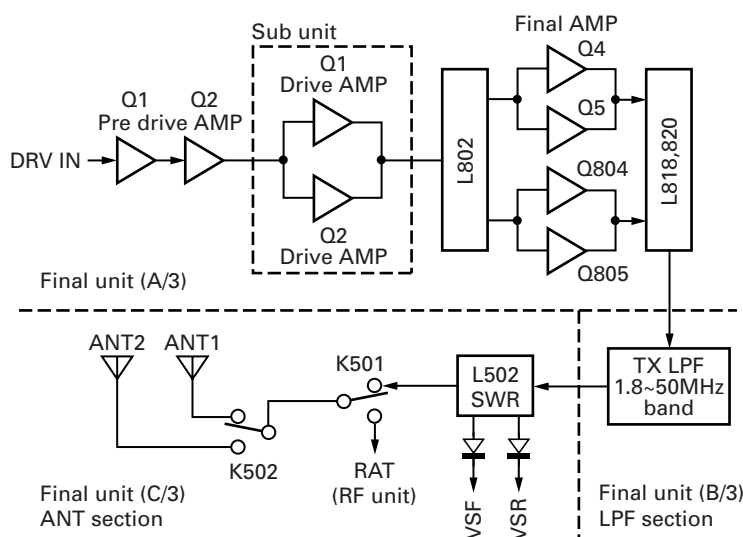
We employed the method of synthesizing 100W outputs to obtain 200W output. This method enables the transceiver to operate at 13.8V supply voltage and the 200W operation of the transceiver by using two 100W class regulated power supplies.

This method is convenient for the fixed use of the transceiver since the existing regulated power supply can be used by using two 100W class regulated power supplies to achieve 200W operation. Although the voltage is applied from two regulated power supplies to each final amplifier (Q4, Q5, Q804, Q805), the amplifier may not work properly when two supply voltages are significantly different and the balance of the output synthesizing part is lost.

Therefore, this transceiver has a protection function that monitors the voltages provided by the regulated power supplies and automatically stops transmission when the potential difference between the two voltages is more than 1V.

The transceiver has another protection function monitoring the heat of R816 of the final unit (X45-366 A/3) by the thermistor (TH2) and detects the unbalance of the outputs produced by each final amplifier, automatically reducing the TX output power when the balance significantly degraded.

## CIRCUIT DESCRIPTION



**Fig. 14 From the drive output to antenna (200W)**

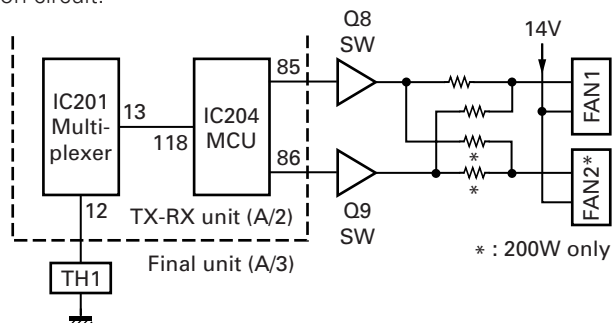
### 3) Common functions between 100W and 200W

With the ideal design for cooling function, this transceiver is the heavy-duty specification transceiver enabling the continuous transmission at the same full power as the fixed transceiver while keeping its size small. However, you should remember that in general, the heat caused by long transmission time shortens the life of parts. Do not close the ventilation ports located on the front and back of the transceiver.

The 200W transceiver has two fans and the 100W transceiver has one fan. The drive circuit of the fan is mounted on the final unit (A/3) and controls the rotating speed of the fan (OFF, slow, fast) corresponding to the generated heat.

This transceiver has a current protection circuit. The collector current of each final amplifier is converted to the potential difference of the resistance (10mΩ) inserted into a power line and the potential difference is detected at IC801 of the TX-RX unit (A/2). The ALC protection function activates with the IC801 output when the potential difference exceeds the predetermined value.

With this function, the transmission output decrease and the excessive current does not flow even if the current in the final part is increased for any reason. In addition, the transceiver has a temperature protection circuit and a SWR protection circuit.



**Fig. 15 From the drive output to antenna (100W and 200W common functions)**

### ■ ALC circuit and transmission power control

Although a discreet circuit has conventionally been used for the ALC circuit, this transceiver has a new type of circuit comprising an operational amplifier. Even though the device is different, the ALC circuit controls the ALC voltage using the forward wave voltage (VSF) and keeps a constant output.

The voltage detected at the forward wave voltage and the reflected wave voltage (VSR) detection circuit of the ANT section of the final unit (C/3) is sent to the TX-RX unit (X57-663 A/2). The forward wave voltage is divided into a suitable voltage at R803 and R804, corresponding to the power type and input into pin 6 of the operation amplifier (IC802), and is then amplified. Part of the forward wave voltage is sent to the meter amplifier comprising the operation amplifier (IC732).

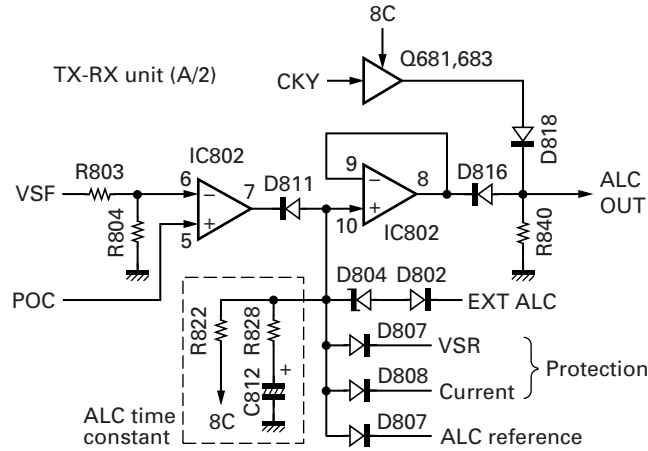
The ALC output provided by pin 7 of IC802 passes through the diode for reverse current prevention (D811), and is then input into pin 10 of IC802. The output provided by pin 8 of IC802 passes through D816, and outputs it as the ALC voltage. The time constant of the ALC is determined by R822, R828, and C812 connected to the line of pin 10 of IC802.

The ALC voltage is sent to the filter section (X57-663 B/2) of the TX-RX unit and controls the gate 2 voltage, and then changes the transmit gain. Part of the ALC voltage is sent to pin 13 of IC802 and amplified at the operation amplifier in IC802, and is then output from pin 14 of IC802. The output is input the MCU (IC204) as the ALC meter voltage (ALM) via the multi-plexer (IC201).

The transmit output control is performed by changing the comparison voltage (POC) of the operation amplifier (IC802). The MCU (IC204) controls the comparison voltage and outputs the DC voltage from pin 6 of the DAC (IC681).

## CIRCUIT DESCRIPTION

The comparison voltage changes by changing the transmit output on the panel. Although the transmit power control was conventionally performed with the hardware control using the voltage of the supply line when the supply voltage lowers, this transceiver uses the software control since the MCU (IC204) always monitors the supply voltage. Therefore, the transmit power gradually changes when the supply voltage is lower than the standard voltage (13.8V).

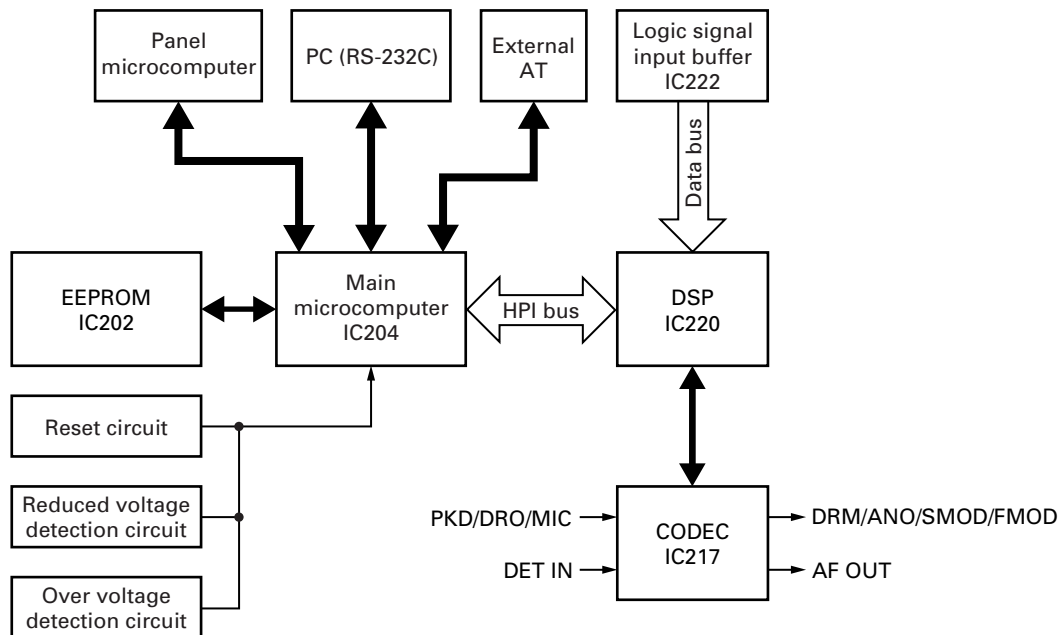


**Fig. 16 ALC circuit and transmission power control**

### Digital Control Circuit

#### ■ Outline

The digital control circuit has a multi-chip configuration around the main microcomputer (IC204) and it has DSP and EEPROM, etc. (Refer to Fig. 17)



**Fig. 17 Digital control circuit**

#### ■ Around the main microcomputer

The main microcomputer operates at 3.3V of the supply voltage and 22.1184MHz of the clock frequency. Three devices (panel microcomputer, PC serial port, and external AT) for serial communication employing the UART function are connected around the main microcomputer. The EEPROM (IC202) is connected for backup purposes. The supply voltage monitoring circuit, including the reset circuit, is also connected.

#### ■ Around the DSP

The DSP (IC220) operates at 1.8 V of the internal core voltage, 3.3V of the external I/O voltage, and 98.304MHz (12.288MHz x 8) of the internal clock frequency. The firmware of the DSP is transferred from the main microcomputer with the HPI bus when the transceiver is turned ON. The HPI bus is also used in the command communication with the main microcomputer. The buffer IC (IC222) is connected to the data bus to enter the logic signal.

The sampling frequency of the CODEC (IC217) is 12kHz and the clock is provided from the DSP. There are two channels for the analog signal input into the CODEC: DET IN and PKD/ DRO/ MIC.

One of PKD/ DRO/ MIC is selected at the analog switch (IC219), which is mounted in the previous stage and is controlled by the main microcomputer. There are two channels for the analog signal output from the CODEC: AF OUT and DRM/ ANO/ SMOD/ FMOD. The destination to be output is selected from DRM/ ANO/ SMOD/ FMOD at the DAC (IC212), which is mounted in the next stage and is controlled by the main microcomputer.

## COMPONENTS DESCRIPTION

### RF Unit (X44-327X-XX)

Ref No.	Use / Function	Operation / Condition / Compatibility
Q1	Switching	ATT changeover relay control (OFF when ATT is ON)
Q2	Switching	Receiving RATB power supply control (ON during reception)
Q3	Amplifier	Transmission drive output amplifier
Q4	Mute	Mutes reception path during transmission (ON during transmission)
Q51~60	Switching	BPF selection
Q151	Switching	ON when preamplifier is ON.
Q152	Switching	ON when preamplifier is OFF.
Q153,154	Amplifier	Preamplifier
Q155	Switching	Gain changeover switch for preamplifier. ON when receiving over 21.5MHz
Q156,157	Mixer	Receiving first mixer
Q158	Switching	Preamplifier power supply control (ON when preamplifier is ON.)
Q159	Amplifier	RX LO1 amplifier
Q160,161	Mixer	Receiving first mixer
Q251	Switching	Transmission IF mute control (Mute when ON.)
Q252	Amplifier	Transmission IF amplifier
Q253	Amplifier	Receiving IF amplifier
Q255	Amplifier	LO2 amplifier
Q256	Switching	Gain correction between bands. ON when receiving over 21.5MHz
Q301	Switching	KYS signal control (ON when KEY is inserted.)
Q302	RX power supply control switch	
IC251	Mixer	Transmission mixer
IC301	Shift register	Q0: Hi when BPF of 7M band is selected. Q1: Hi when BPF of 10M band is selected. Q2: Hi when BPF of 14M band is selected. Q3: Hi when BPF of 3.5M band is selected. Q4: Hi when BPF of BC band is selected. Q5: Hi when BPF of 21M band is selected. Q6: Hi when BPF of 50M band is selected. Q7: Hi when BPF of 30~60M band is selected. Q8: Hi when BPF of 28M band is selected. Q9: Hi when BPF of 1.8M band is selected.

Ref No.	Use / Function	Operation / Condition / Compatibility
		Q10: Hi when ATT is ON. Q11: Hi when preamplifier is ON.
D1	Surge absorption	For ATT changeover relay
D2~5	Limter	
D51	Switching	ON when receiving over 1.705MHz is selected.
D52	Switching	ON when receiving under 1.705MHz is selected.
D53	Switching	ON during transmission
D54	Switching	ON when receiving over 1.705MHz is selected.
D55	Switching	ON when BPF of 1.705~2.5MHz is selected.
D56	Switching	1/2: ON when BPF of 2.5~4.1MHz is selected. 2/2: ON when BPF of 14.5~21.5MHz is selected.
D57	Switching	1/2: ON when BPF of 7.5~10.5MHz is selected. 2/2: ON when BPF of 30~49MHz and 54~60MHz are selected.
D58	Switching	1/2: ON when BPF of 4.1~7.5MHz is selected. 2/2: ON when BPF of 21.5~30MHz is selected.
D59	Switching	1/2: ON when BPF of 10.5~14.5MHz is selected. 2/2: ON when BPF of 49~54 MHz is selected.
D60	Switching	ON when receiving under 1.705MHz is selected.
D61	Switching	ON when BPF of 2.5~4.1MHz is selected.
D62	Switching	ON when BPF of 4.1~7.5MHz is selected.
D63	Switching	ON when BPF of 7.5~10.5MHz is selected.
D64	Switching	ON when BPF of 10.5~14.5MHz is selected.
D65	Switching	ON when BPF of 14.5~21.5MHz is selected.
D66	Switching	ON when BPF of 21.5~30MHz is selected.
D67	Switching	ON when BPF of 30~49MHz and 54~60MHz are selected.
D68	Switching	ON when BPF of 49~54MHz is selected.
D69	Switching	ON when BPF of 1.705~2.5MHz is selected.



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## COMPONENTS DESCRIPTION

Ref No.	Use / Function	Operation / Condition / Compatibility
D151	Switching	ON when receiving preamplifier is OFF
D152	Switching	1/2: ON when receiving preamplifier is OFF 2/2: ON when receiving preamplifier is ON
D154	Switching	LO1 path transmission/reception changeover
D155	Switching	73.095 MHz IF path transmission/ reception changeover
D156	Switching	On when receiving preamplifier is ON
D251	Switching	ON during transmission
D252	Switching	IF path transmission/reception changeover
D253	Reverse current prevention	AGC
D254	Attenuator	PGC
D255	Switching	IF path transmission/reception changeover
D256	Mixer	RX 2nd/TX mixer
D301~304	Reverse current prevention	PADDLE/KEY terminal

### Final Unit (X45-365X-XX) (A/3)

Ref No.	Use / Function	Operation / Condition / Compatibility
Q1,2	Pre-drive amplifier	
Q3	Bias control	Final stage bias current control
Q4,5	Final amplifier	
Q6	Switching	Final power supply
Q7	Switching	Q6 gate bias control
Q8,9	Switching	FAN control switch
Q10	Switching	Power supply control for internal AT
Q11	Switching	Q10 gate bias control
Q891	Switching	Relay (K891) control switch
IC1	AVR	B→8C
IC2	AVR	14V→5V
IC801	Extended I/O	AT coil control signal (Serial→Parallel)
IC802	Extended I/O	AT output C control signal (Serial→Parallel)
IC803	Extended I/O	AT input C control signal (Serial→Parallel)
IC804,805	Buffer	Convert 3V to 5V.
D1,2	Temperature compensation	Final stage bias current control
D3	Surge absorption	Power supply surge protection
D4	Surge absorption	FAN
D801~824	Surge absorption	Relay (K801~824)
D891	Surge absorption	Relay (K891)

### Final Unit (X45-365X-XX) (B/3)

Ref No.	Use / Function	Operation / Condition / Compatibility
D100	LED	Backlight for KENWOOD logo
D101	Surge absorption	Relay (K102)
D151	Surge absorption	Relay (K152)
D201	Surge absorption	Relay (K202)
D251	Surge absorption	Relay (K252)
D301	Surge absorption	Relay (K302)
D351	Surge absorption	Relay (K352)
D401	Surge absorption	Relay (K402)
D451	Surge absorption	Relay (K452)

### Final Unit (X45-365X-XX) (C/3)

Ref No.	Use / Function	Operation / Condition / Compatibility
Q501~504	Driver	LPF changeover relay control
Q505	Driver	ANT/AT changeover relay control
Q506,507	Signal amplifier	AT phase signal amplifier
Q508	Driver	Transmission/reception changeover relay (K501) control
IC501	Extended I/O	LPF control signal (Serial→Parallel)
IC502	Comparator	AT control amplitude signal discrimination
IC503	D flip-flop	AT control phase signal discrimination
IC509,510	Inverter	
D501	High-frequency rectification	Reflected wave detection
D502	High-frequency rectification	Forward wave detection
D503	Surge absorption	Relay (K501)
D504	High-frequency rectification	AT amplitude signal detection
D505	High-frequency rectification	AT phase signal detection
D506	Surge absorption	Relay (K502)
D507	Surge absorption	Relay (K503)
D508,509	Surge absorption	Lightning surge protection

### Final Unit (X45-366X-XX) (A/3)

Ref No.	Use / Function	Operation / Condition / Compatibility
Q1,2	Pre-drive amplifier	
Q3	Bias control	Final (Q4, Q5) stage bias current control
Q4,5	Final amplifier	
Q6	Switching	B→14V

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## COMPONENTS DESCRIPTION

Ref No.	Use / Function	Operation / Condition / Compatibility
Q7	Switching	Q6 gate bias control
Q8,9	Switching	FAN control switch
Q803	Bias control	Final (Q804, Q805) stage bias current control
Q804,805	Final amplifier	
Q806	Switching	Final (Q804, Q805) stage bias voltage generation
Q807	Switching	Q806 gate bias control
IC1	AVR	B→5V
IC2	AVR	14S→8C
IC3	AVR	14V→8V (Final (Q804, Q805) stage bias power supply)
D2,3	Temperature compensation	Final (Q4, Q5) stage bias current control
D4	Surge absorption	FAN
D5	Surge absorption	Power supply surge protection
D6	Surge absorption	FAN
D802,803	Temperature compensation	Final (Q804, Q805) stage bias current control
D806	Surge absorption	Power supply surge protection
D807	High-frequency rectification	

### Final Unit (X45-366X-XX) (B/3)

Ref No.	Use / Function	Operation / Condition / Compatibility
D100	LED	Backlight for KENWOOD logo
D101	Surge absorption	Relay (K102)
D151	Surge absorption	Relay (K152)
D201	Surge absorption	Relay (K202)
D251	Surge absorption	Relay (K252)
D301	Surge absorption	Relay (K302)
D351	Surge absorption	Relay (K352)
D401	Surge absorption	Relay (K402)
D451	Surge absorption	Relay (K452)

### Final Unit (X45-366X-XX) (C/3)

Ref No.	Use / Function	Operation / Condition / Compatibility
Q501~504	Driver	LPF changeover relay control
Q505	Driver	ANT changeover relay control
Q506	Driver	Transmission/reception changeover relay control
IC501	Extended I/O	LPF control signal (Serial→Parallel)

Ref No.	Use / Function	Operation / Condition / Compatibility
D501	High-frequency rectification	Reflected wave detection
D502	High-frequency rectification	Forward wave detection
D503	Surge absorption	Transmission/reception changeover Relay (K501)
D504	Surge absorption	ANT changeover relay (K502)
D505,506	Surge absorption	Lightning surge protection

### Display Unit (X54-3410-00)

Ref No.	Use / Function	Operation / Condition / Compatibility
Q1~4	Switching	LCD dimmer control
Q5,6	Switching	Dimmer control for key illumination
Q7	Switching	5V power supply switch
IC1,2	LCD driver	
IC3	MCU	Panel microcomputer
IC4,5	AND gate	Buffer
IC6	AVR	5V
D1~4	LED	LCD backlight
D5~9	Reverse current prevention	Key matrix
D10~13	LED	LCD backlight
D14	LED	Lights during transmission
D15	LED	Lights during reception
D16~36	LED	Backlight
D37	Reset circuit	

### TX-RX Unit (X57-663X-XX) (A/2)

Ref No.	Use / Function	Operation / Condition / Compatibility
Q1	Crystal oscillator circuit	Crystal oscillation circuit (15.6MHz)
Q2	Amplifier	IC1-CLK input amplifier
Q3	Buffer	31.2MHz buffer
Q4	Buffer	15.6MHz buffer
Q5	Doubler	15.6MHz x 2
Q6	Amplifier	IC2-CLK input amplifier
Q7	Buffer	DDS output buffer
Q8	Doubler	31.2MHz x 2
Q9	Amplifier	Differential amplifier
Q10	Buffer	DDS output buffer
Q11	Buffer	Impedance converter

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## COMPONENTS DESCRIPTION

Ref No.	Use / Function	Operation / Condition / Compatibility
Q12	Doubler	31.2MHz x 2
Q13	Switching	LO1 filter cutoff changeover control
Q14	Amplifier	PLL-Fin amplifier
Q15	Amplifier	LO1 amplifier
Q16	Switching	NFMT signal
Q17	Ripple filter	Filter for VCO power supply
Q18	Switching	Loop filter time constant changeover switch
Q19	Mute switch	Mutes FM modulation input
Q131	Inverter	SQC
Q132	Switching	RL output switch
Q133	Amplifier	ANI/ANO signal amplifier, Amplitude limit
Q134	Switching	Relay (K131) control
Q135	Switching	RL output switch control
Q136	Inverter	PKS signal
Q137	Inverter	RTK signal
Q138	Inverter	SS signal
Q201,202	AVR	Panel power supply
Q203	Switching	IC203 (RS-232C) power supply control
Q204	Switching	Power supply voltage protection
Q205	Inverter	
Q207	Switching	5C power supply switch
Q451	VCO1	Oscillation FET
Q452	VCO2	Oscillation FET
Q453,454	Switching	VCO select switch
Q455	Amplifier	VCO output amplifier
Q456	VCO3	Oscillation FET
Q457	Switching	VCO select switch
Q501	Amplifier	NB circuit input
Q502	Differential amplifier	NB IF amplifier
Q503	Amplifier	NB AGC control amplifier
Q504	Amplifier	NB IF amplifier
Q505	Switching	Audio mute signal is generated
Q506	Buffer	NB IF
Q507	Switching	Audio mute signal is generated
Q508	Buffer	NB input buffer
Q551	AGC amplifier	AGC amplifier for receiving second IF
Q552	AGC amplifier	AGC voltage control
Q553	Switching	AGC-OFF switch
Q554	AGC amplifier	AGC amplifier for receiving second IF
Q556	Amplifier	IF amplifier for AM/AGC

Ref No.	Use / Function	Operation / Condition / Compatibility
Q557	Buffer	Output buffer for AM detection signal
Q558	Amplifier	Output amplifier for SSB/CW detection signal
Q559	Switching	IF mute signal
Q560	Switching	Option filter insertion loss correction switch
Q561,562	Switching	IF amplifier mute switch
Q563	Switching	ON while receiving in FM mode
Q621	Amplifier	Output amplifier of SSB/CW modulator
Q622	AVR	Power supply of SSB/CW modulator
Q623	Buffer	CAR input buffer of SSB/CW modulator
Q624	AVR	Power supply of SSB/CW modulator
Q625	Amplifier	Modulation input of SSB/CW modulator
Q681	Switching	CKY control
Q682	Switching	TXB power supply generation switch
Q683	Switching	CKY control
Q684,685	Switching	RXB power supply generation switch
Q686	Switching	AGC voltage charge switch control
Q731	Switching	For meter
Q732	Switching	FMB
Q733	Switching	AMB/SCB
Q734	Switching	AF mute switch
Q735	Ripple filter	For audio amplifier power supply
Q737	Switching	Audio output relay changeover control
Q803	Switching	ALC time constant changeover switch
Q805	Switching	AGC voltage charge switch control
Q806	Over drive protection	
Q807	Switching	
IC1	DDS	LO1-PLL reference signal is generated
IC2	DDS	CAR generation
IC3	PLL	LO1 control
IC201	Multiplexer	Input signal changeover for entering it into the A/D port of MCU (IC204)
IC202	EEPROM	
IC203	Level converter	RS-232C level and 5 V conversion
IC204	MCU	Main microcomputer
IC205	Buffer IC	Voltage conversion: 3V→5V
IC207	Buffer IC	Voltage conversion: 5V→3V
IC208	Buffer IC	Voltage conversion: 3V→5V
IC209	Buffer IC	Voltage conversion: 5V→3V
IC210,211	Reset IC	
IC212	A/D	Electrical volume, Control signal is generated

# TS-480HX/480SAT

## COMPONENTS DESCRIPTION

Ref No.	Use / Function	Operation / Condition / Compatibility
IC213	3.3V AVR	
IC214	Filter amplifier	CODEC output signal
IC215	3.3V AVR	DSP power supply
IC216	1.8V AVR	DSP power supply
IC217	CODEC	
IC218	Anti-aliasing filter	CODEC input signal
IC219	Analog switch	
IC220	DSP	
IC221	MIC amplifier	
IC222	Buffer	
IC223	Inverter	
IC224	Amplifier	RX signal amplifier, Reference voltage generation
IC225,226	Buffer IC	Voltage conversion: 3V→5V
IC227	Buffer	
IC551	FM IC	FM detection
IC552	Analog switch	AGC/ALC voltage changeover
IC553	Mixer IC	SSB/ CW demodulator
IC554	Amplifier	FM S-meter voltage amplifier
IC621	Mixer IC	SSB/ CW transmission modulator
IC681	D/A	Ao1: NBL/MOB Ao2: CAR-LEVEL Ao3: IFGC Ao4: AGC-REF Ao5: PGC Ao6: POC Ao7: VREF Vo8: PRO
IC682	Analog switch	AGC time constant changeover, S-meter changeover
IC683	OP amplifier	Buffer for S-meter
IC684	Analog switch	NBL changeover switch
IC685	Analog switch	AGC voltage charge
IC695	5V AVR	
IC731	Shift register	Q0: Low when SSB/CW/FSK mode is selected. Q1: Low when AM mode is selected. Q2: Low when FM mode is selected. Q3: Hi when the 270Hz option filter is selected.

Ref No.	Use / Function	Operation / Condition / Compatibility
		Q4: Hi when the 1.8kHz option filter is selected. Q5: Hi when AGC is slow. Q6: Hi when AGC is OFF. Q7: Low when the 6kHz filter is selected. Q8: Low when the 2.4kHz filter is selected. Q9: Low when option filter 1 is selected. Q10: Low when option filter 2 is selected. Q11: Low when receiving in FM mode.
IC732	OP amplifier	Buffer/ amplifier for meter
IC733	Analog switch	Reception detection output changeover
IC734	AF AMP	
IC801	OP amplifier	Power supply voltage protection
IC802	OP amplifier	ALC protection
D1	Variable capacitance diode	For FM phase modulation
D2,3	Switching	LO1 filter cutoff changeover
D4	Reverse current prevention	
D131	Limiter	SQC over input protection
D132	Limiter	ANI amplitude limit
D133	Limiter	SS over input protection
D134	Limiter	ANI amplitude limit
D135	Limiter	RTK over input protection
D136	Surge absorption	Relay (K131)
D137	Limiter	Over input protection
D138	Reverse current prevention	
D139	Limiter	Over input protection
D202	Poly-switch	Current limit
D203,204	Limiter	Over input protection
D205	Reverse current prevention	
D206	10V Zener diode	Panel power supply reference voltage generation
D207	Limiter	Over input protection
D208	Reverse current prevention	
D210	Reverse current prevention	
D211	Limiter	Over input protection

# TS-480HX/480SAT

## COMPONENTS DESCRIPTION

Ref No.	Use / Function	Operation / Condition / Compatibility
D212	18V Zener diode	Voltage shift
D213	Reverse current prevention	
D351~354	Limiter	Over input protection
D355,356	Reverse current prevention	
D357	Poly-switch	Current limit
D358,359	Reverse current prevention	
D360	Poly-switch	Current limit
D451,452	Varicap	VCO oscillation frequency variance
D453	Switching	ON when VCO1 is selected.
D454	Switching	ON when VCO2 is selected.
D455	Varicap	VCO oscillation frequency variance
D456	Switching	ON when VCO3 is selected.
D501	Rectification	NB voltage generation
D551	PIN diode	IF gain control (IFGC)
D552	Rectification	AGC control voltage generation
D555	Rectification	AM detection
D557~559	Reverse current prevention	
D621,622	Voltage shift	Reference voltage generation of TX modulator power supply
D623	Temperature compensation	
D624	Reverse current prevention	
D625	Temperature compensation	
D681~683	Reverse current prevention	
D733~735	Reverse current prevention	
D736	Surge absorption	Relay (K731)
D801	5.1V Zener diode	
D802	Reverse current prevention	
D804	Voltage shift	External ALC voltage
D805~808	Reverse current prevention	
D809	Limiter	Over voltage protection

Ref No.	Use / Function	Operation / Condition / Compatibility
D810	Voltage shift	
D811~813	Reverse current prevention	
D816,817	Reverse current prevention	
D818,819	Temperature compensation	

### TX-RX Unit (X57-663X-XX) (B/2)

Ref No.	Use / Function	Operation / Condition / Compatibility
Q901	Amplifier	10.695MHz IF amplifier (AGC/ALC amplifier)
Q902	Switching	Q901 mute switch (Mute when ON)
Q903	Switching	TXB discharge switch (ON during transmission)
Q971	Amplifier	10.695 MHz IF amplifier for receiving
D901	Attenuator	IFGC voltage control
D902	Switching	ON during transmission
D903	Attenuator	IFGC voltage control
D904	Switching	ON during reception
D905	Reverse current prevention	
D906	Switching	ON during reception
D931	Switching	ON when SSB mode is selected.
D932	Switching	1/2: ON when FM mode is selected. 2/2: ON when AM mode is selected.
D933	Switching	ON when option filter is selected.
D934	Switching	ON when AM mode is selected.
D935	Switching	ON when option filter is selected.
D936	Switching	ON when SSB mode is selected.
D937	Switching	ON when option filter is selected.
D938	Switching	ON during transmission.
D939	Switching	ON when option filter is selected.
D940	Switching	ON when FM mode is selected.
D941	Switching	ON when AM mode is selected.
D944,945	Limiter	

### Sub Unit (X58-4900-XX)

Ref No.	Use / Function	Operation / Condition / Compatibility
Q1,2	Amplifier	Drive amplifier
D1,2	Voltage shift	

## Main Microcomputer : HD64F2338VFC25 (TX-RX Unit IC204)

Pin No.	Name	I/O	Function
1	DRO	O	CODEC input (VGS-1 playback) change-over instruction    H : VGS-1 playback
2	PKD	O	CODEC input (PKD) changeover instruction    H : When PKD input is selected
3	Vcc1	I	Power supply voltage 3.3V
4	WAIT	I	Bus cycle wait state request
5~8	HA0~HA3	O	Address bus
9	Vss1	-	GND
10~13	NC	-	
14~17	TYP0~TYP3	I	Market code detection
18	Vss2	-	GND
19~22	TYP4~TYP7	I	Market code detection
23	DASH	I	Electronic key dash signal    L : Dash ON
24	DOT	I	Electronic key dot signal    L : Dot ON
25	KYS	I	Key jack connection detection H : Key jack connection
26	KEY	I	Key down signal    L : Key down
27	Vss3	-	GND
28	TXC	O	Transmission power supply instruction H : Transmission, L : Reception
29	CKY	O	Transmission power output instruction H : Transmission output
30	ABK	O	ABK signal    H : AF blanking
31	BEEP	O	Beep pattern instruction    H : Beep output
32	DRES	O	DSP reset output    L→H : Reset
33	MIC	O	CODEC input (MIC) changeover instruction H : When MIC input is selected
34	VOS	O	Voice output changeover instruction H : Voice output
35	SSR	I	PTT transmission instruction H : PTT transmission, L : Reception
36	PKSR	I	Packet transmission/ Cross-band transmission instruction Normal    H : Transmission, L : Reception Cross-band    H : Reception, L : Transmission
37	STPC	I	Interrupt for returning from sleep mode (PC)    L→H : Interrupt
38	STPA	I	Interrupt for returning from sleep mode (Panal)    H→L : Interrupt
39	Vcc2	I	Power supply voltage 3.3V
40	TYPX	I	Function detection 1
41	BOVR	I	Over voltage detection interrupt H→L : Interrupt

Pin No.	Name	I/O	Function
42	BKC	I	Reduced voltage detection interrupt H→L : Interrupt
43	SPS	I	External speaker detection signal input H : When Speaker jack is connected
44	DADT	O	D/A (X57 IC212) exclusive data
45	DACK	O	D/A (X57 IC212) exclusive clock
46	IEN3	O	D/A (X57 IC212) exclusive enable
47	Vss4	-	GND
48	LNA1	O	LINEA control signal 1 (relay) H : Relay operation selection
49	LNA2	O	LINEA control signal 2 (RL) H : RL output selection
50	PKP	O	Cross-band repeater operation instruction L : Cross-band selection
51	SQC	O	Squelch signal    H : Open, L : Close
52~55	HD0~HD3	O	Data bus
56	Vss5	-	GND
57~60	HD4~HD7	O	Data bus
61	Vcc3	I	Power supply voltage 3.3V
62	TXD0	O	Panel microcomputer communication data output
63	TXD1	O	The data output to PC/IF
64	RXD0	I	Panel microcomputer communication data input
65	RXD1	I	Data input from PC/IF
66	PHSW	O	External / internal speaker changeover L : Internal speaker
67	AMU	O	AF mute signal (Power ON/OFF) H : AF blanking
68	TCS	O	AT tuning status instruction H : During AT tuning
69	STS	O	RS-232 IC start instruction H : RS-232 power on
70	RTS1	O	The UART operation instruction output to PC/IF
71	Vss6	-	GND
72	CTS1	I	The UART operation instruction input from PC/IF
73	BUSY	I	VGS-1 busy status detection    H : Busy VGS-1 connection detection (Power ON)
74	PLAY	I	VGS-1 playback detection L →H : Playback start
75	NC	I	



# TS-480HX/480SAT

## SEMICONDUCTOR DATA

Pin No.	Name	I/O	Function
76	DRE	O	VGS-1 enable
77	NC	I/O	
78	RST	O	VGS-1 reset signal L→H : Reset
79	REN	O	RF serial parallel enable
80	PRGS	O	Pre-amplifier gain changeover instruction H : High band, L : Low band
81	ATEN	O	AT enable
82	PSC1	O	Power supply relay control 1 H : Power ON
83	PSC2	O	Power supply relay control 2 H : Power ON
84	FEN1	O	Final serial parallel enable 1 (AT control)
85	FANL	O	Fan low-speed rotation instruction L : Fan stop
86	FANH	O	Fan high-speed rotation instruction H : High-speed rotation
87	NC	O	
88	REST	I	Hard reset input
89	NMI	I	H : Normal
90	STBY	I	Hardware standby terminal H : Normal
91	Vcc4	I	Power supply voltage 3.3V
92	XTL	I	Crystal oscillator (22.1184MHz)
93	EXTL	I	Crystal oscillator (22.1184MHz)
94	Vss7	-	GND
95	NC	I	
96	Vcc5	I	Power supply voltage 3.3V
97	FWE	I	Flash write enable L : Normal, H : During writing
98	NC	O	
99	HRD	O	External address space lead terminal H : Normal
100	HWR	O	External space write strobe (D8~D15)
101	IEN2	O	IF serial parallel enable 2 (For DAC)
102	IEN1	O	IF serial parallel enable 1
103	DATA	O	Common data
104	CLK	O	Common clock
105	TTO	O	External AT control
106	TSI	I	External AT control
107	FEN2	O	Final serial parallel enable
108	TSO	O	External AT control
109	TTI	I	External AT control

Pin No.	Name	I/O	Function
110	TYPY	I	Function detection 2
111	AMD	I	Amplitude comparison detection instruction
112	PHD	I	Phase comparison detection instruction
113	AVcc	I	Power supply voltage 3.3V
114	Vref	I	Power supply voltage 3.3V
115	VDT1	I	Power supply voltage detection 1
116	VDT2	I	Power supply voltage detection 2
117	VSFM	I	Forward wave voltage
118	VSRM	I	Reflected wave voltage
119	AXC	I	A/D input (THP1/THP2/FIL1/FIL2)
120	AYC	I	A/D input (MUP/MDN/ALC/UNB)
121	SM	I	S-meter voltage
122	SQL	I	Squelch voltage
123	Avss	-	GND
124	Vss8	-	GND
125	ADC1	O	Analog switch control signal
126	ADC2	O	Analog switch control signal
127	EEN	O	EEPROM enable
128	EDA	I	EEPROM data input
129	ECK	O	EEPROM clock
130	ESI	O	EEPROM data output
131	RBK	O	RBK signal H : RF blanking
132	DENB	O	DDS enable 2
133	DENA	O	DDS enable 1
134	PENA	O	PLL enable
135	MD0	I	Operation mode setting terminal 0 L : Normal, H : During writing
136	MD1	I	Operation mode setting terminal 1 H : Normal/During writing
137	MD2	I	Operation mode setting terminal 2 H : Normal, L : During writing
138	PDCK	O	PLL common clock
139	PDDA	O	PLL common data
140	VCO1	O	VCO1 changeover instruction H : VCO1 selection
141	VCO2	O	VCO2 changeover instruction H : VCO2 selection
142	VCO3	O	VCO3 changeover instruction H : VCO3 selection
143	HCS	O	DSP control chip select
144	UL	I	Unlock signal

# TS-480HX/480SAT

## SEMICONDUCTOR DATA

### Panel Microcomputer : 30622M8A-7N0GP (Display Unit IC3)

Pin No.	Name	I/O	Function
1	P94	O	Key illumination LED control signal
2~5	P93~P90	O	Dimmer output 3~0
6	BYTE	I	Single chip mode selection (Vss connection)
7	CNVSS	I	Single chip mode selection (Vss connection)
8,9	P87, P86	-	Not used
10	RESET	I	For Reset L : Reset
11	XOUT	O	System clock output
12	VSS	-	GND
13	XIN	I	System clock input
14	VCC	-	Power supply input
15	P85	-	Not used
16	INT2	-	Not used
17	INT1	I	Interrupt from a serial reception port
18	INT0	I	MULTI encoder pulse 1 input
19	TA4IN	I	Main encoder
20	TA4OUT	I	Main encoder
21	TA3IN	I	RIT encoder
22	TA3OUT	I	RIT encoder
23	P75	I	MULTI/CH Encoder input
24	P74	-	Not used
25	P73	I	Speaker jack insertion detection
26	P72	-	Not used
27	P71	O	Busy LED control signal
28	P70	O	TX LED control signal
29~31	P67~P65	-	Not used
32	CTS0	-	Not used
33	TXD0	O	The serial port for connection with the main unit
34	RXD0	I	The serial port for connection with the main unit

Pin No.	Name	I/O	Function
35	P61	-	Not used
36	CTS0	-	Not used
37~44	P57~P50	-	Not used
45~50	P47~P42	-	Not used
51	P41	O	LCD segment display off control output
52	P40	-	Not used
53	P37	O	LCD clock output
54	P36	O	LCD data output
55	P35	O	LCD driver 0 chip select output
56	P34	O	LCD driver 1 chip select output
57~59	P33~P31	-	Not used
60	VCC	-	Power supply input
61	P30	-	Not used
62	VSS	-	GND
63~65	P27~P25	-	Not used
66~70	P24~P20	O	Key scan output bit 4~0
71~78	P17~P10	I	Key scan input bit 7~0
79~86	P07~P00	-	Not used
87	P107	-	Not used
88,89	AN6, AN5	-	Not used
90	AN4	I	Power key input L:ON
91	AN3	-	Not used
92	AN2	I	SQ/RF VOL(A/D)
93	AN1	I	AF VOL(A/D)
94	AVSS	-	Analog power supply input (GND)
95	AN0	I	IF-SHIFT VOL(A/D)
96	VREF	-	A/D reference voltage input
97	AVCC	-	Analog power supply input (5C)
98,99	P97, P96	-	Not used
100	P95	O	Key illumination LED control signal

# TS-480HX/480SAT

## SEMICONDUCTOR DATA

### Extended I/O Port

#### ■ RF unit

Pin No.	Port name	Pin name	Function	Active level	Condition
IC301 : BU2099FV (Shift register)					
5	LCK	REN			
6	Q0	BPF4	4.10~7.50MHz BPF	L	When BPF is selected
7	Q1	BPF5	7.50~10.5MHz BPF	L	When BPF is selected
8	Q2	BPF6	10.5~14.5MHz BPF	L	When BPF is selected
9	Q3	BPF3	2.50~4.10MHz BPF	L	When BPF is selected
10	Q4	BPF1	30k~1.705MHz BPF	L	When BPF is selected
11	Q5	BPF7	14.5~21.5MHz BPF	L	When BPF is selected
12	Q6	BPF10	49.0~54.0MHz BPF	L	When BPF is selected
13	Q7	BPF9	30~49, 54~60MHz BPF	L	When BPF is selected
14	Q8	BPF8	21.5~30.0MHz BPF	L	When BPF is selected
15	Q9	BPF2	1.705~2.5MHz BPF	L	When BPF is selected
16	Q10	ATT	RX-ATT ON/OFF	L	When ATT is ON
17	Q11	PRE	Pre-AMP ON/OFF	H	When Pre-AMP is ON

#### ■ Final unit

Pin No.	Port name	Pin name	Function	Active level	Condition
IC501 : BU2099FV (Extended I/O), Enable : FEN2					
6	Q0	NC			
7	Q1	NC			
8	Q2	ANT'	HF ANT2 switching relay	H	L : ANT1, H : ANT2
9	Q3	ATS'	In/Through switching relay	L	L : In, H : Through
10	Q4	50M'	50M LPF relay	L	$30.0 \leq f \leq 60.0$ (MHz)
11	Q5	10M'	10M LPF relay	L	$7.50 \leq f < 10.50$ (MHz)
12	Q6	4M'	3.5M LPF relay	L	$2.50 \leq f < 4.70$ (MHz)
13	Q7	14M'	14M LPF relay	L	$10.50 \leq f < 14.50$ (MHz)
14	Q8	28M'	24 / 28M LPF relay	L	$21.50 \leq f < 30.0$ (MHz)
15	Q9	7M'	5 / 7M LPF relay	L	$4.70 \leq f < 7.50$ (MHz)
16	Q10	2M'	1.8M LPF relay	L	$f < 2.50$ (MHz)
17	Q11	21M'	18 / 21M LPF relay	L	$14.50 \leq f < 21.50$ (MHz)
IC801 : UPD6345GS (Extended I/O), Enable : FEN1, 100W only					
12	Q1	L (1)	50M coil	L	$30.0 \leq f \leq 60.0$ (MHz)
11	Q2	L (2)	28M coil	L	$25.50 \leq f < 30.0$ (MHz)
10	Q3	L (3)	24.9M coil	L	$21.50 \leq f < 25.50$ (MHz)
9	Q4	L (4)	18, 21M coil	L	$14.50 \leq f < 21.50$ (MHz), $30.0 \leq f \leq 60.0$ (MHz)
8	Q5	L (5)	14M coil	L	$10.50 \leq f < 14.50$ (MHz)
7	Q6	L (6)	10M coil	L	$7.50 \leq f < 10.50$ (MHz)
6	Q7	L (7)	7M coil	L	$6.90 \leq f < 7.50$ (MHz), $30 \leq f < 60.0$ (MHz)
5	Q8	L (8)	3.5M coil	L	$2.50 \leq f < 4.70$ (MHz), $18.50 \leq f < 60.0$ (MHz)

# TS-480HX/480SAT

## SEMICONDUCTOR DATA

Pin No.	Port name	Pin name	Function	Active level	Condition
IC803 : UPD6345GS (Extended I/O), Enable : FEN1, 100W only					
12	Q1	CI (1)	25p capacitor switching	L	Phase error correction C1 On : Active, Off : Inactive
11	Q2	CI (2)	5p capacitor switching	L	Phase error correction C2 On : Active, Off : Inactive
10	Q3	CI (3)	10p capacitor switching	L	Phase error correction C3 On : Active, Off : Inactive
9	Q4	CI (4)	18p capacitor switching	L	Phase error correction C4 On : Active, Off : Inactive
8	Q5	CI (5)	39p capacitor switching	L	Phase error correction C5 On : Active, Off : Inactive
7	Q6	CI (6)	75p capacitor switching	L	Phase error correction C6 On : Active, Off : Inactive
6	Q7	CI (7)	150p capacitor switching	L	Phase error correction C7 On : Active, Off : Inactive
5	Q8	CI (8)	300p capacitor switching	L	Phase error correction C8 On : Active, Off : Inactive
IC802 : UPD6345GS (Extended I/O), Enable : FEN1, 100W only					
12	Q1	CO(1)	25p capacitor switching	L	Amplitude error correction C1 On : Active, Off : Inactive
11	Q2	CO(2)	5p capacitor switching	L	Amplitude error correction C2 On : Active, Off : Inactive
10	Q3	CO(3)	10p capacitor switching	L	Amplitude error correction C3 On : Active, Off : Inactive
9	Q4	CO(4)	18p capacitor switching	L	Amplitude error correction C4 On : Active, Off : Inactive
8	Q5	CO(5)	39p capacitor switching	L	Amplitude error correction C5 On : Active, Off : Inactive
7	Q6	CO(6)	75p capacitor switching	L	Amplitude error correction C6 On : Active, Off : Inactive
6	Q7	CO(7)	150p capacitor switching	L	Amplitude error correction C7 On : Active, Off : Inactive
5	Q8	CO(8)	300p capacitor switching	L	Amplitude error correction C8 On : Active, Off : Inactive

### ■ TX-RX unit

Pin No.	Port name	Pin name	Function	Active level	Condition
IC731 : BU2099FV (Shift register)					
5	LCK	IEN1			
6	Q0	SCC	SSB/CW/FSK power supply	L	When SSB,CW and FSK modes are selected
7	Q1	AMC	AM power supply	L	When AM mode is selected
8	Q2	FMC	FM power supply	L	When FM mode is selected
9	Q3	270H	270Hz option filter gain correction	L	When 270Hz filter is selected
10	Q4	1.8k	1.8kHz option filter gain correction	H	When 1.8kHz filter is selected
11	Q5	AGCSLOW	AGC-SLOW SW	H	When AGC SLOW is selected
12	Q6	AGCOFF	AGC-OFF SW	H	When AGC OFF is selected
13	Q7	FILT1	6kHz AM filter selection	L	When 6kHz filter is selected
14	Q8	FILT2	2.4kHz SSB filter selection	L	When 2.4kHz filter is selected
15	Q9	FILT3	Option filter 1	L	When option filter 1 is selected
16	Q10	FILT4	Option filter 2	L	When option filter 2 is selected
17	Q11	FILT5	Filter through	L	When FM mode is selected
IC681 : M62353AGP (D/A)					
12	LD	IEN2			
15	Ao1	NBL/MOB	NB threshold voltage output, FM transmission modulation bias output		
2	Ao2	CAR LEVEL	CAR adjustment voltage output		
3	Ao3	IFGC	IF-Gain control voltage output		
4	Ao4	AGC REF	AGC reference voltage output		
5	Ao5	PGC	RF Gain control voltage output		
6	Ao6	POC	Power control voltage output		
7	Ao7	VREF	ALC reference voltage		
10	Ao8	PRO	Protection control reference voltage		

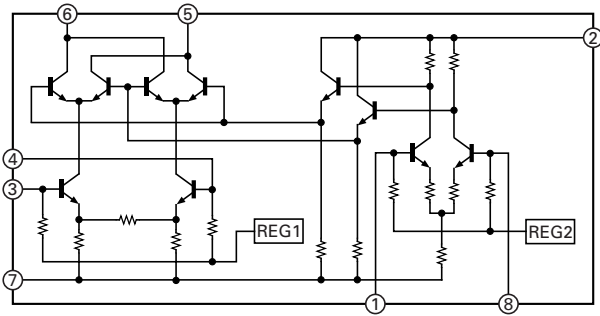
# TS-480HX/480SAT

## SEMICONDUCTOR DATA

Pin No.	Port name	Pin name	Function	Active level	Condition
IC212 : M62364FP (A/D)					
6	LD	IEN3			
1	VIN1	VOI	VGS-1 playback signal input		Uses only to playback VGS-1.
2	VOUT1	VOO	VGS-1 playback signal output		Uses only to playback VGS-1.
3	VOUT2	NC			
4	VIN2	NC			
9	VIN3	GND	GND		
10	VOUT3	NC			
11	VOUT4	FMT	FM transmission signal		During transmission in FM mode : 00
12	VIN4	GND	GND		
13	VIN5		CODEC output signal input		
14	VOUT5	DRM	VGS-1 input signal output		During VGS-1 recording standby time/constant recording
15	VOUT6	ANO	ANO signal output		
16	VIN6		CODEC output signal input		
21	VIN7		CODEC output signal input		
22	VOUT7	FMOD	FM modulation signal output		During transmission in FM mode : FF
23	VOUT8	SMOD	SSB modulation signal output		During transmission in modes other than FM mode : FF
24	VIN8		CODEC output signal input		

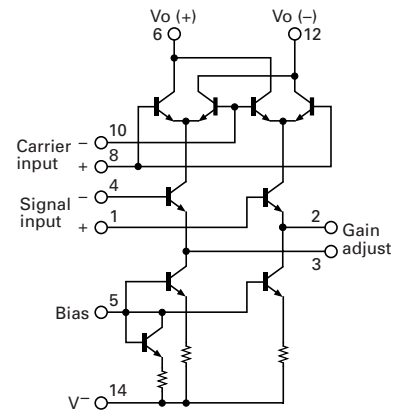
### Mixer : TC4107F (RF Unit IC251)

#### ■ Equivalent circuit



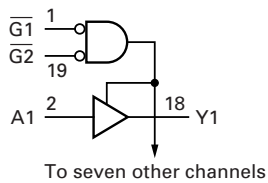
### Mixer : NJM1496V (TX-RX Unit IC621)

#### ■ Equivalent circuit



### Buffer : HD74LV541AT (TX-RX Unit IC222)

#### ■ Logic diagram



#### ■ Function table

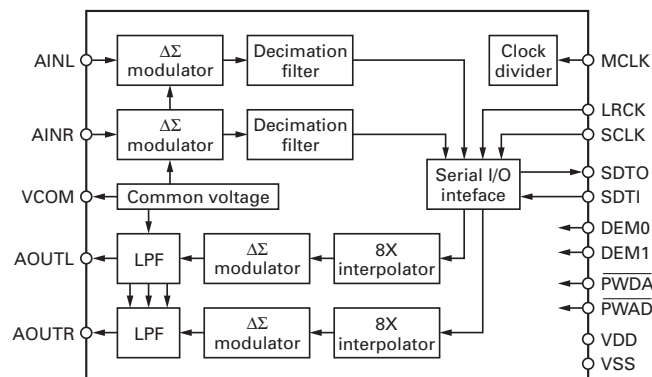
Inputs			Output
$\overline{G1}$	$\overline{G2}$	A1	Y1
L	L	L	L
L	L	H	H
H	X	X	Z
X	H	X	Z

H : High level  
 L : Low level  
 X : Immaterial  
 Z : High impedance

## SEMICONDUCTOR DATA

**CODEC : AK4550VT (TX-RX Unit IC217)**

### ■ Block diagram

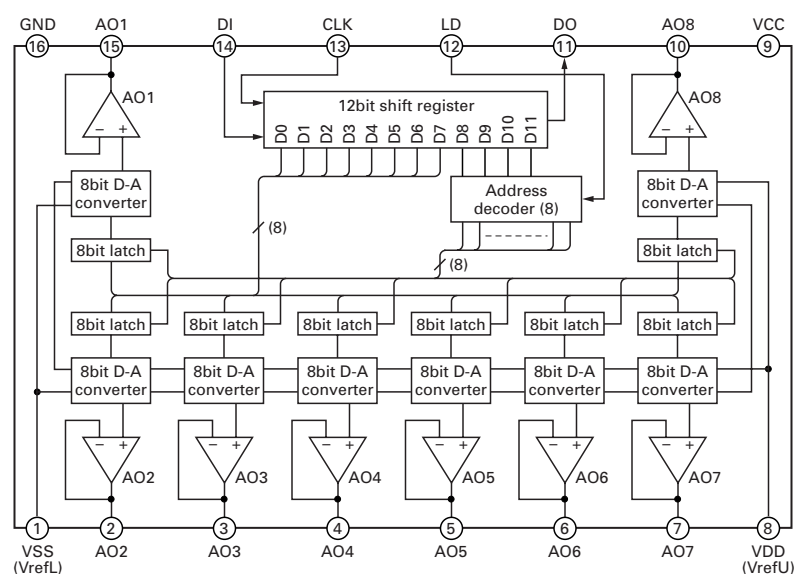


### ■ Pin function

No.	Name	I/O	Function
1	VCOM	O	Common voltage output, $0.45 \times V_{DD}$
2	AINR	I	Rch analog input
3	AINL	I	Lch analog input
4	VSS	-	Ground
5	VDD	-	Power supply
6	DEM0	I	De-emphasis control
7	DEM1	I	De-emphasis control
8	SDTO	O	Audio serial data output
9	SFTI	I	Audio serial data input
10	LRCK	I	Input/output channel clock
11	MCLK	I	Master clock input
12	SCLK	I	Audio serial data clock
13	$\overline{\text{PWAD}}$	I	ADC power down & reset mode "L" : Power down
14	$\overline{\text{PWDA}}$	I	DAC power down & reset mode "L" : Power down
15	AOUTL	O	Lch analog output
16	AOUTR	O	Rch analog output

**D/A : M62353AGP (TX-RX Unit IC681)**

### ■ Block diagram



### ■ Pin function

No.	Name	Function
14	DI	Serial data input
11	DO	Serial data output
13	CLK	Serial clock input
12	LD	LD terminal input high level then latch circuit data load
15	AO1	8 bit D-A converter output
2	AO2	
3	AO3	
4	AO4	
5	AO5	
6	AO6	
7	AO7	
10	AO8	
9	VCC	Power supply
16	GND	Digital and analog common GND
8	VDD	D-A converter high level reference voltage input
1	VSS	D-A converter low level reference voltage input



# TS-480HX/480SAT

## PARTS LIST

\* New Parts. ⚠ indicates safety critical components.

Parts without **Parts No.** are not supplied.

Les articles non mentionnés dans le **Parts No.** ne sont pas fournis.

Teile ohne **Parts No.** werden nicht geliefert.

**L** : Scandinavia

**Y** : PX (Far East, Hawaii)

**Y** : AAFES (Europe)

**K** : USA

**T** : England

**X** : Australia

**P** : Canada

**E** : Europe

**M** : Other Areas

### TS-480HX/480SAT (Y52-328X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination
<b>TS-480HX/480SAT</b>					
1	1B	*	A01-2189-02	CABINET (UPPER)	KH, EH KS, ES
2	1D, 1F	*	A01-2190-02	CABINET (LOWER)	
3	3A, 3F	*	A10-4061-01	CHASSIS	
3	3A, 3D	*	A10-4062-01	CHASSIS	
4	3G	*	A62-1076-03	PANEL ASSY	EH, ES KH, KS
5	3A	*	A62-1079-01	PANEL	
6	1H	*	A82-0052-11	REAR PANEL	
8	1B	*	B03-3610-03	DRESSING PLATE	
9	1D, 1F		B42-2455-04	STICKER	EH, ES KH, KS
10	1C, 1E		B42-5650-04	S/NO. LABEL	
11	1J		B42-7003-04	RATING LABEL (DC CORD)	
12	1D, 1F		B42-7019-04	STANDARD LABEL (FCC)	
14	1C, 1E		B42-7070-04	STANDARD LABEL (FCC)	EH, ES KH, KS
15	1B		B42-7116-04	STICKER (ANT)	
14	1C, 1E		B42-7126-04	STANDARD LABEL (E-MARK)	
17	1K	*	B52-0619-00	SCHEMATIC DIAGRAM	
18	1K	*	B52-0620-10	SCHEMATIC DIAGRAM	EH, ES EH, ES EH, ES EH, ES
19	1K	*	B62-1735-10	INSTRUCTION MANUAL (ENGLISH)	
20	1K	*	B62-1736-10	INSTRUCTION MANUAL (GERMANY)	
21	1K	*	B62-1750-10	INSTRUCTION MANUAL (FRENCH)	
22	1K	*	B62-1751-10	INSTRUCTION MANUAL (ITALIAN)	EH, ES EH, ES EH, ES EH, ES
23	1K	*	B62-1752-10	INSTRUCTION MANUAL (SPANISH)	
24	1K	*	B62-1753-10	INSTRUCTION MANUAL (DOUCHE)	
25	1E	*	B72-2166-04	MODEL NAME PLATE	KH KS EH ES
25	1C	*	B72-2167-04	MODEL NAME PLATE	
25	1E	*	B72-2168-04	MODEL NAME PLATE	
25	1C	*	B72-2169-04	MODEL NAME PLATE	
27	3B		E30-3009-15	ANTENNA CABLE (ANT)	EH, ES
28	1J	*	E30-3488-05	MODULAR CABLE (PANEL, 4M)	
29	1J, 2J	*	E30-3489-05	DC CORD	
30	1J	*	E30-3500-05	MODULAR CABLE (PANEL, 20CM)	
-		*	E37-1059-05	LEAD WIRE WITH CONNECTOR (X57 CN369)	KS, ES KS, ES
-		*	E37-1060-05	LEAD WIRE WITH MINIPIN PLUG (X57 CN501)	
-		*	E37-1061-05	LEAD WIRE WITH MINIPIN PLUG (X57 CN3)	
-		*	E37-1062-05	LEAD WIRE WITH MINIPIN PLUG (X57 CN1)	
-		*	E37-1063-05	LEAD WIRE WITH MINIPIN PLUG (X44 CN2)	KS, ES KS, ES
-		*	E37-1064-05	LEAD WIRE WITH MINIPIN PLUG (X44 CN1)	
-		*	E37-1067-05	LEAD WIRE WITH MINIPIN PLUG (X45 CN504)	
-		*	E37-1068-05	LEAD WIRE WITH MINIPIN PLUG (X45 CN505)	
39	2A, 2D, 2F	*	E37-1069-05	FLAT CABLE (X57 CN395, 403)	KH KS EH ES
40	2A	*	E37-1070-05	FLAT CABLE (X57 CN375)	
41	2B	*	E37-1071-05	FLAT CABLE (X45 CN501)	
42	1G	*	E37-1072-05	LEAD WIRE WITH CONNECTOR (SP)	
43	2A	*	E37-1073-05	LEAD WIRE WITH CONNECTOR (EXT. AT)	KH KS EH ES
44	1K	*	E57-0404-05	DIN PLUG (6P ACC)	
45	1K	*	E57-0405-05	DIN PLUG (8P ACC)	
47	1J, 1K		F05-2531-05	FUSE (BLADE) (25A/32V)	
48	2D, 2F, 1K		F06-4027-05	FUSE (BLADE) (4A/32V)	KS, ES
49	3C, 3E	*	F07-1874-05	COVER (FAN)	
50	3A	*	F07-1875-13	COVER (DIN, SP, KEY)	
51	3C	*	F07-1878-04	COVER (FAN)	
52	3C, 3E	*	F09-0478-05	FAN MOTOR	EH, ES
53	2D, 2F	*	F10-2450-02	SHIELDING COVER (X45 A/3)	
54	2A	*	F10-2456-03	SHIELDING COVER (X57 A/2)	KS, ES
55	2B	*	F10-2470-02	SHIELDING COVER (X45 B/3)	
56	3C	*	F15-1007-04	SHIELDING PLATE (DC2)	
58	3G		G02-0505-05	KNOB SPRING	KH, EH KS, ES
59	2A		G02-0570-04	FLAT SPRING (X57 IC734)	
60	3G	*	G02-0898-04	FLAT SPRING (TORQUE LEVER)	
61	3G		G09-0405-05	KNOB SPRING	
62	1B	*	G10-1305-04	FIBROUS SHEET	KH, EH KS, ES
63	1B	*	G10-1306-04	FIBROUS SHEET	
64	1D, 1F	*	G10-1307-04	FIBROUS SHEET	
65	3A	*	G10-1308-04	FIBROUS SHEET	
66	3A	*	G10-1309-04	FIBROUS SHEET	KH, EH KS, ES
67	3A	*	G10-1310-04	FIBROUS SHEET	
68	1H	*	G10-1311-04	FIBROUS SHEET	
69	3G	*	G10-1313-14	FIBROUS SHEET	
-			G10-1326-04	FIBROUS SHEET	KH, EH KS, ES
70	1B		G10-1328-04	FIBROUS SHEET	
71	1K	*	G11-4228-04	SHEET	
72	1H	*	G11-4245-04	SHEET	
73	1K	*	G11-4269-04	SHEET	KH, EH KS, ES
74	3H	*	G11-4270-04	SHEET	
75	2H, 3H	*	G11-4278-04	SHEET	
76	2H, 3H		G11-4287-04	SHEET	
77	2A		G13-1871-05	CONDUCTIVE CUSHION	KH, EH KS, ES
78	2F		G13-1872-05	CONDUCTIVE CUSHION	
79	2H		G13-1888-04	CUSHION	
80	1J	*	G13-2022-14	CUSHION	
81	1H	*	G13-2024-04	CUSHION	KH, EH KS, ES
82	1H	*	G53-1559-02	PACKING	
83	2J	*	H12-3142-02	PACKING FIXTURE	
84	2K	*	H12-3153-02	PACKING FIXTURE	
85	2K	*	H12-3154-02	PACKING FIXTURE	EH, ES
86	1K		H25-0029-04	PROTECTION BAG (60/110/0.07)	
87	1J, 2J		H25-0796-04	PROTECTION BAG	
88	1K		H25-2013-04	PROTECTION BAG (80*180 T=0.08)	
89	1K		H25-2320-04	PROTECTION BAG	KH KS EH ES
90	1J, 1K	*	H25-2327-04	PROTECTION BAG (100/250/0.07)	
91	1J, 1K	*	H25-2343-04	PROTECTION BAG	
92	1K, 2K	*	H25-2352-04	PROTECTION BAG (250/350/0.07)	
93	3K	*	H52-1944-02	ITEM CARTON CASE	KH KS EH ES
93	3K	*	H52-1945-02	ITEM CARTON CASE	
93	3K	*	H52-1946-02	ITEM CARTON CASE	
93	3K	*	H52-1947-02	ITEM CARTON CASE	
95	1D, 1F		J02-0441-05	FOOT	EH, ES
96	1K	*	J09-0409-03	STAND	
97	1G	*	J21-8449-04	HARDWARE FIXTURE	
98	1J	*	J29-0663-13	BRACKET	
99	1K	*	J29-0705-01	BRACKET	EH, ES
100	1K	*	J29-0706-04	BRACKET	
101	1K	*	J29-0707-03	BRACKET	
-			J61-0307-05	BAND	
104	1J		K01-0420-05	HANDLE	EH, ES
105	3G	*	K21-1105-03	KNOB (MAIN DIAL)	
106	3H	*	K29-9263-02	KEY TOP	

**KH : TS-480HX (K)**

**EH : TS-480HX (E)**

**KS : TS-480SAT (K)**

**ES : TS-480SAT (E)**

# TS-480HX/480SAT

## PARTS LIST

### TS-480HX/480SAT RF UNIT (X44-327X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination
107	3G	*	K29-9264-04	KNOB RING	EH,ES
108	3G	*	K29-9265-03	KNOB	
109	3G	*	K29-9266-03	KNOB	
110	3G	*	K29-9267-03	KNOB	
111	3G	*	K29-9270-03	KNOB	
114	1J,1K		L79-1408-05	LINE FILTER (WITH BAND)	EH,ES
115	1K		L79-1417-05	LINE FILTER	
A	3G		N14-0582-14	CIRCULAR NUT	KS,ES
B	3D,3F		N15-1040-46	FLAT WASHER	
C	3G	*	N19-0670-05	SPECIAL WASHER	
D	1B,1D,1F		N33-2606-45	OVAL HEAD MACHINE SCREW	
E	3C	*	N35-3014-45	BINDING HEAD MACHINE SCREW	
F	3D,3F		N35-4010-46	BINDING HEAD MACHINE SCREW	KS,ES
G	3C,3E	*	N66-3020-45	PAN HEAD SEMS SCREW B	
H	2D,2F		N67-2608-46	PAN HEAD SEMS SCREW W	
J	1H		N80-2016-45	PAN HEAD TAPTITE SCREW	
K	1G		N82-2605-46	BINDING HEAD TAPTITE SCREW	
L	2B,2D,2F		N87-2608-46	BRAZIER HEAD TAPTITE SCREW	EH,ES
117	1K	*	N99-2035-05	SCREW SET	
118	1J	*	N99-2041-05	SCREW SET	
121	1G		T07-0298-05	SPEAKER	EH,ES
122	1K	*	T91-0638-05	MICROPHONE	
124	2H	*	W02-1836-15	ENCODER	KH,EH
126	2F	*	X58-4900-00	SUB UNIT	
126	2D	*	X58-4900-01	SUB UNIT	KS,ES

### RF UNIT (X44-327X-XX) 0-00 : KH,KS 2-71 : EH,ES

C1			CK73FB1H102K	CHIP C	1000PF	K	KS,ES
C2		*	C90-4111-05	ELECTRO	470UF	16WV	
C3			CK73GB1C103K	CHIP C	0.010UF	K	
C4			CC73GCH1H390J	CHIP C	39PF	J	
C5			CK73GB1H103K	CHIP C	0.010UF	K	
C6			CK73FB1C105K	CHIP C	1.0UF	K	KS,ES
C7			CK73GB1C104K	CHIP C	0.10UF	K	
C8			CC73GCH1H470J	CHIP C	47PF	J	
C10			CK73GB1C104K	CHIP C	0.10UF	K	
C11			CC73GCH1H080B	CHIP C	8.0PF	B	
C12			CC73GCH1H470J	CHIP C	47PF	J	KS,ES
C13			CK73FB1E104K	CHIP C	0.10UF	K	
C14			CK73GB1H103K	CHIP C	0.010UF	K	
C15			CK73EB1H104K	CHIP C	0.10UF	K	
C16			CK73GB1H102K	CHIP C	1000PF	K	
C17			CK73GB1C104K	CHIP C	0.10UF	K	KS,ES
C18			CK73EB1H104K	CHIP C	0.10UF	K	
C19			CK73GB1C104K	CHIP C	0.10UF	K	
C20			CK73GB1H103K	CHIP C	0.010UF	K	
C22			CK73GB1H103K	CHIP C	0.010UF	K	
C23			CC73FCH1H150J	CHIP C	15PF	J	KS,ES
C24			CK73GB1H103K	CHIP C	0.010UF	K	
C25			CE04EW1E4R7M	ELECTRO	4.7UF	25WV	
C26			CK73GB1H103K	CHIP C	0.010UF	K	
C28			CK73FB1E104K	CHIP C	0.10UF	K	
C29			CK73FB1C105K	CHIP C	1.0UF	K	KS,ES
C30			CK73FB1H102K	CHIP C	1000PF	K	
C32		*	C90-4111-05	ELECTRO	470UF	16WV	
C33			CC73GCH1H180J	CHIP C	18PF	J	

Ref. No.	Address	New parts	Parts No.	Description			Desti- nation
C51			CC73FCH1H152J	CHIP C	1500PF	J	
C52			CK73GB1C104K	CHIP C	0.10UF	K	
C53,54			CC73FCH1H222J	CHIP C	2200PF	J	
C55			CC73FCH1H152J	CHIP C	1500PF	J	
C56-59			CC73FCH1H222J	CHIP C	2200PF	J	
C60		*	CC73FCH1H122J	CHIP C	1200PF	J	
C61			CK73GB1C104K	CHIP C	0.10UF	K	
C62			CC73FCH1H182J	CHIP C	1800PF	J	
C63			CK73GB1C104K	CHIP C	0.10UF	K	
C64			CC73GCH1H821J	CHIP C	820PF	J	
C65			CK73GB1C104K	CHIP C	0.10UF	K	
C66			CC73GCH1H681J	CHIP C	680PF	J	
C67			CK73GB1C104K	CHIP C	0.10UF	K	
C68			CC73GCH1H471J	CHIP C	470PF	J	
C69			CK73GB1C104K	CHIP C	0.10UF	K	
C70			CC73GCH1H331J	CHIP C	330PF	J	
C71			CK73GB1C104K	CHIP C	0.10UF	K	
C72			CC73GCH1H221J	CHIP C	220PF	J	
C73			CK73GB1C104K	CHIP C	0.10UF	K	
C74			CC73GCH1H560J	CHIP C	56PF	J	
C75			CK73GB1C104K	CHIP C	0.10UF	K	
C76			CC73GCH1H121J	CHIP C	120PF	J	
C77			CK73GB1C104K	CHIP C	0.10UF	K	
C78			CC73GCH1H221J	CHIP C	220PF	J	
C79			CC73GCH1H102J	CHIP C	1000PF	J	
C80			CC73FCH1H222J	CHIP C	2200PF	J	
C81-88			CC73GCH1H102J	CHIP C	1000PF	J	
C89			CC73GCH1H560J	CHIP C	56PF	J	
C90			CC73FCH1H122J	CHIP C	1200PF	J	
C91			CC73GCH1H680J	CHIP C	68PF	J	
C92			CC73GCH1H471J	CHIP C	470PF	J	
C93			CC73GCH1H331J	CHIP C	330PF	J	
C94			CC73GCH1H101J	CHIP C	100PF	J	
C95			CC73GCH1H680J	CHIP C	68PF	J	
C96			CC73GCH1H151J	CHIP C	150PF	J	
C97			CC73GCH1H820J	CHIP C	82PF	J	
C98			CK73GB1H103K	CHIP C	0.010UF	K	
C99-107			CC73GCH1H102J	CHIP C	1000PF	J	
C108			CK73FB1C105K	CHIP C	1.0UF	K	
C109			CK73GB1C104K	CHIP C	0.10UF	K	
C110		*	CC73FCH1H122J	CHIP C	1200PF	J	
C111			CK73GB1C104K	CHIP C	0.10UF	K	
C112			CC73FCH1H182J	CHIP C	1800PF	J	
C113			CK73GB1C104K	CHIP C	0.10UF	K	
C114			CC73GCH1H821J	CHIP C	820PF	J	
C115			CK73GB1C104K	CHIP C	0.10UF	K	
C116			CC73GCH1H681J	CHIP C	680PF	J	
C117			CK73GB1C104K	CHIP C	0.10UF	K	
C118			CC73GCH1H471J	CHIP C	470PF	J	
C119			CK73GB1C104K	CHIP C	0.10UF	K	
C120			CC73GCH1H331J	CHIP C	330PF	J	
C121			CK73GB1C104K	CHIP C	0.10UF	K	
C122			CC73GCH1H221J	CHIP C	220PF	J	
C123			CK73GB1C104K	CHIP C	0.10UF	K	
C124			CC73GCH1H560J	CHIP C	56PF	J	
C125			CK73GB1C104K	CHIP C	0.10UF	K	EH,ES
C126			CC73GCH1H181J	CHIP C	180PF	J	
C127			CK73GB1C104K	CHIP C	0.10UF	K	
C128			CC73FCH1H222J	CHIP C	2200PF	J	
C129,130			CC73GCH1H090B	CHIP C	9.0PF	B	

KH : TS-480HX (K) KS : TS-480SAT (K)  
EH : TS-480HX (E) ES : TS-480SAT (E)

## PARTS LIST

RF UNIT (X44-327X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
C131			CC73GCH1H150J	CHIP C 15PF J		C285-287			CK73GB1H103K	CHIP C 0.010UF K	
C151			CK73GB1H103K	CHIP C 0.010UF K		C288			CK73GB1H102K	CHIP C 1000PF K	
C152			CK73GB1H102K	CHIP C 1000PF K		C290			CK73GB1H103K	CHIP C 0.010UF K	
C153			CK73GB1C104K	CHIP C 0.10UF K		C291			CC73GCH1H090B	CHIP C 9.0PF B	
C154			CK73FB1E104K	CHIP C 0.10UF K		C292			CC73GCH1H220J	CHIP C 22PF J	
C155			CK73GB1H103K	CHIP C 0.010UF K		C293			CK73GB1H103K	CHIP C 0.010UF K	
C156			CC73GCH1H050B	CHIP C 5.0PF B		C295			CK73GB1C104K	CHIP C 0.10UF K	
C157			CK73GB1C104K	CHIP C 0.10UF K		C297			CC73GCH1H330J	CHIP C 33PF J	
C158			CC73GCH1H560J	CHIP C 56PF J		C298			CK73GB1H103K	CHIP C 0.010UF K	
C159			CK73GB1C104K	CHIP C 0.10UF K		C301			CK73GB1H103K	CHIP C 0.010UF K	
C161			CC73GCH1H150J	CHIP C 15PF J		C302			CK73GB1C104K	CHIP C 0.10UF K	
C162			CC73GCH1H820J	CHIP C 82PF J		C303-305			CK73GB1H102K	CHIP C 1000PF K	
C163			CC73GCH1H390J	CHIP C 39PF J		C321-325			CK73GB1H102K	CHIP C 1000PF K	
C164			CK73GB1H103K	CHIP C 0.010UF K		TC51,52			C05-0385-05	CERAMIC TRIMMER CAP (20PF)	EH,ES
C165			CC73GCH1H330J	CHIP C 33PF J		-			E18-0254-05	SOCKET	
C166,167			CK73FB1E104K	CHIP C 0.10UF K		CN1,2			E04-0154-05	PIN SOCKET	
C168			CK73GB1C104K	CHIP C 0.10UF K		CN4			E40-5487-05	PIN ASSY	
C169			CK73FB1E104K	CHIP C 0.10UF K		CN51,52			E40-5487-05	PIN ASSY	
C170,171			CK73GB1C104K	CHIP C 0.10UF K		CN152			E40-0211-05	PIN ASSY	
C173			CK73GB1C104K	CHIP C 0.10UF K		CN153			E04-0154-05	PIN SOCKET	
C174			CC73GCH1H102J	CHIP C 1000PF J		CN252			E40-0211-05	PIN ASSY	
C176			CK73GB1H102K	CHIP C 1000PF K		CN253			E04-0154-05	PIN SOCKET	
C177,178			CK73GB1H103K	CHIP C 0.010UF K		CN254			E04-0191-05	PIN SOCKET	
C179			CK73GB1H102K	CHIP C 1000PF K		CN309			E40-5978-05	FLAT CABLE CONNECTOR	
C180			CK73FB1E104K	CHIP C 0.10UF K		J301,302			E11-0455-05	3.5D PHONE JACK (3P)	
C181			CK73GB1H103K	CHIP C 0.010UF K		-	*		F10-2462-04	SHIELDING CASE	
C182			CC73GCH1H020B	CHIP C 2.0PF B		-	*		F10-2478-04	SHIELDING CASE	
C184			CK73GB1H102K	CHIP C 1000PF K		-	*		F10-2483-04	SHIELDING CASE	
C185			CK73GB1H471K	CHIP C 470PF K		-	*		F10-2493-04	SHIELDING CASE	
C186			CK73GB1H103K	CHIP C 0.010UF K		-	*		F20-3320-04	INSULATING SHEET	
C187			CK73GB1C104K	CHIP C 0.10UF K		L1			L40-1005-34	SMALL FIXED INDUCTOR (10UH)	
C188			CK73GB1H471K	CHIP C 470PF K		L2			L40-1085-34	SMALL FIXED INDUCTOR (100NH)	
C190			CK73GB1H102K	CHIP C 1000PF K		L3,4			L40-4705-34	SMALL FIXED INDUCTOR (47UH)	
C191,192			CK73GB1H103K	CHIP C 0.010UF K		L5			L40-1005-34	SMALL FIXED INDUCTOR (10UH)	
C193			CC73GCH1H020B	CHIP C 2.0PF B		L6	*		L41-1585-09	SMALL FIXED INDUCTOR	
C194			CK73GB1H102K	CHIP C 1000PF K		L7			L33-0695-05	SMALL FIXED INDUCTOR	
C195			CC73GCH1H010B	CHIP C 1.0PF B		L9			L33-0695-05	SMALL FIXED INDUCTOR	
C196			CC73GCH1H030B	CHIP C 3.0PF B		L10	*		L41-2785-08	SMALL FIXED INDUCTOR	
C198			CK73GB1H102K	CHIP C 1000PF K		L11			L41-1085-08	SMALL FIXED INDUCTOR	
C200			CK73GB1H103K	CHIP C 0.010UF K		L51	*		L41-6895-09	SMALL FIXED INDUCTOR	EH,ES
C201			CK73GB1H102K	CHIP C 1000PF K		L52			L33-0695-05	SMALL FIXED INDUCTOR	
C252			CK73GB1H103K	CHIP C 0.010UF K		L53	*		L41-6895-09	SMALL FIXED INDUCTOR	EH,ES
C253-255			CK73GB1C104K	CHIP C 0.10UF K		L54	*		L41-5695-09	SMALL FIXED INDUCTOR	
C256-258			CK73GB1H103K	CHIP C 0.010UF K		L55			L33-0695-05	SMALL FIXED INDUCTOR	
C259			CK73GB1H471K	CHIP C 470PF K		L56,57	*		L41-6895-09	SMALL FIXED INDUCTOR	
C260			CK73GB1H103K	CHIP C 0.010UF K		L58	*		L41-2295-09	SMALL FIXED INDUCTOR	
C261			CC73GUJ1H040C	CHIP C 4.0PF C		L59	*		L41-1595-09	SMALL FIXED INDUCTOR	
C262,263			CK73GB1H103K	CHIP C 0.010UF K		L60	*		L41-1095-09	SMALL FIXED INDUCTOR	
C266,267			CK73GB1H102K	CHIP C 1000PF K		L61	*		L41-4785-08	SMALL FIXED INDUCTOR	
C268			CC73GCH1H010B	CHIP C 1.0PF B		L62	*		L41-3985-08	SMALL FIXED INDUCTOR	
C269-271			CK73GB1H102K	CHIP C 1000PF K		L63	*		L41-2785-08	SMALL FIXED INDUCTOR	
C272			CK73GB1C104K	CHIP C 0.10UF K		L64	*		L41-1885-08	SMALL FIXED INDUCTOR	
C273			CK73GB1H102K	CHIP C 1000PF K		L65	*		L41-1585-08	SMALL FIXED INDUCTOR	
C274			CK73GB1H103K	CHIP C 0.010UF K		L66			L34-4569-05	AIR-CORE COIL	
C275			CC73GCH1H060B	CHIP C 6.0PF B		L67	*		L41-6895-09	SMALL FIXED INDUCTOR	
C276			CK73GB1H102K	CHIP C 1000PF K		L68			L33-0695-05	SMALL FIXED INDUCTOR	
C277			CK73GB1H103K	CHIP C 0.010UF K		L69	*		L41-5695-09	SMALL FIXED INDUCTOR	
C278-280			CK73GB1H102K	CHIP C 1000PF K		L70	*		L41-6885-09	SMALL FIXED INDUCTOR	
C281			CC73GCH1H010B	CHIP C 1.0PF B		L71	*		L41-1895-09	SMALL FIXED INDUCTOR	
C282			CK73GB1H103K	CHIP C 0.010UF K							

KH : TS-480HX (K)    KS : TS-480SAT (K)  
EH : TS-480HX (E)    ES : TS-480SAT (E)

# TS-480HX/480SAT

## PARTS LIST

### RF UNIT (X44-327X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
L72		*	L41-1295-09	SMALL FIXED INDUCTOR		R15			RK73GB1J101J	CHIP R 100 J 1/16W	
L73		*	L41-2795-09	SMALL FIXED INDUCTOR		R16			RK73GB1J222J	CHIP R 2.2K J 1/16W	
L74		*	L41-2295-09	SMALL FIXED INDUCTOR		R17			RK73GB1J151J	CHIP R 150 J 1/16W	
L75		*	L41-2785-08	SMALL FIXED INDUCTOR		R18,19			RK73FB2A560J	CHIP R 56 J 1/10W	
L77			L33-0695-05	SMALL FIXED INDUCTOR		R20,21			RK73GB1J472J	CHIP R 4.7K J 1/16W	
L78		*	L41-2295-09	SMALL FIXED INDUCTOR		R22			R92-0670-05	CHIP R 0 OHM	
L79		*	L41-1595-09	SMALL FIXED INDUCTOR		R51-60			RK73FB2A470J	CHIP R 47 J 1/10W	
L80		*	L41-1095-09	SMALL FIXED INDUCTOR		R61			RK73GB1J471J	CHIP R 470 J 1/16W	
L81		*	L41-4785-08	SMALL FIXED INDUCTOR		R62-70			RK73GB1J330J	CHIP R 33 J 1/16W	
L82		*	L41-3985-08	SMALL FIXED INDUCTOR		R71-80			RK73FB2A470J	CHIP R 47 J 1/10W	
L83		*	L41-2785-08	SMALL FIXED INDUCTOR		R81			RK73GB1J560J	CHIP R 56 J 1/16W	
L84		*	L41-1885-08	SMALL FIXED INDUCTOR		R82			RK73GB1J472J	CHIP R 4.7K J 1/16W	
L85		*	L41-1585-08	SMALL FIXED INDUCTOR		R151			RK73GB1J103J	CHIP R 10K J 1/16W	
L86			L34-4569-05	AIR-CORE COIL		R152			RK73FB2A221J	CHIP R 220 J 1/10W	
L87		*	L41-2785-08	SMALL FIXED INDUCTOR		R153,154			RK73FB2A121J	CHIP R 120 J 1/10W	
L151			L33-0695-05	SMALL FIXED INDUCTOR		R155			RK73GB1J682J	CHIP R 6.8K J 1/16W	
L152		*	L39-1476-05	TOROIDAL COIL		R156			RK73GB1J104J	CHIP R 100K J 1/16W	
L153			L40-3385-34	SMALL FIXED INDUCTOR (330NH)		R157			RK73GB1J473J	CHIP R 47K J 1/16W	
L154			L40-3391-37	SMALL FIXED INDUCTOR (3.3UH)		R158			RK73GB1J182J	CHIP R 1.8K J 1/16W	
L155		*	L41-1585-08	SMALL FIXED INDUCTOR		R159			RK73GB1J473J	CHIP R 47K J 1/16W	
L156		*	L41-1085-08	SMALL FIXED INDUCTOR		R160			RK73GB1J471J	CHIP R 470 J 1/16W	
L157,158		*	L39-1476-05	TOROIDAL COIL		R161-164			RK73GB1J100J	CHIP R 10 J 1/16W	
L159		*	L39-1480-05	TOROIDAL COIL		R165			RK73GB1J683J	CHIP R 68K J 1/16W	
L160			L40-4785-34	SMALL FIXED INDUCTOR (470NH)		R167			RK73FB2A470J	CHIP R 47 J 1/10W	
L161			L40-1015-34	SMALL FIXED INDUCTOR (100UH)		R168			RK73GB1J470J	CHIP R 47 J 1/16W	
L162			L40-4705-34	SMALL FIXED INDUCTOR (47UH)		R170			R92-1252-05	CHIP R 0 OHM J 1/16W	
L163			L40-1015-34	SMALL FIXED INDUCTOR (100UH)		R172			RK73GB1J562J	CHIP R 5.6K J 1/16W	
L164		*	L34-4709-05	COIL		R173			RK73GB1J100J	CHIP R 10 J 1/16W	
L165			L40-1005-34	SMALL FIXED INDUCTOR (10UH)		R174			RK73FB2A471J	CHIP R 470 J 1/10W	
L166-168			L34-4408-05	COIL		R175			RK73FB2A561J	CHIP R 560 J 1/10W	
L251			L40-1015-34	SMALL FIXED INDUCTOR (100UH)		R176			RK73GB1J473J	CHIP R 47K J 1/16W	
L252		*	L39-1476-05	TOROIDAL COIL		R177,178			RK73GB1J681J	CHIP R 680 J 1/16W	
L253		*	L39-1480-05	TOROIDAL COIL		R179			RK73GB1J120J	CHIP R 12 J 1/16W	
L254			L40-4705-34	SMALL FIXED INDUCTOR (47UH)		R181			RK73GB1J102J	CHIP R 1.0K J 1/16W	
L255			L40-3985-34	SMALL FIXED INDUCTOR (390NH)		R182,183			RK73GB1J100J	CHIP R 10 J 1/16W	
L256			L40-1085-34	SMALL FIXED INDUCTOR (100NH)		R184			RK73GB1J271J	CHIP R 270 J 1/16W	
L257,258			L40-4785-34	SMALL FIXED INDUCTOR (470NH)		R185			RK73GB1J220J	CHIP R 22 J 1/16W	
L259			L40-1005-34	SMALL FIXED INDUCTOR (10UH)		R186,187			RK73GB1J100J	CHIP R 10 J 1/16W	
L260,261			L40-4705-34	SMALL FIXED INDUCTOR (47UH)		R188			RK73GB1J471J	CHIP R 470 J 1/16W	
L262		*	L39-1480-05	TOROIDAL COIL		R189			RK73GB1J681J	CHIP R 680 J 1/16W	
L263			L40-4785-34	SMALL FIXED INDUCTOR (470NH)		R190			RK73GB1J103J	CHIP R 10K J 1/16W	
L264		*	L39-1480-05	TOROIDAL COIL		R191			RK73GB1J102J	CHIP R 1.0K J 1/16W	
L265			L40-4785-34	SMALL FIXED INDUCTOR (470NH)		R192			RK73GB1J333J	CHIP R 33K J 1/16W	
L301-305			L40-1091-37	SMALL FIXED INDUCTOR (1.000UH)		R193			RK73GB1J103J	CHIP R 10K J 1/16W	
XF151		*	L71-0605-05	MCF (73.095MHZ)		R194			RK73FB2A100J	CHIP R 10 J 1/10W	
CP302,303			RK75GB1J103J	CHIP-COM 10K J 1/16W		R195			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R1			RK73GB1J821J	CHIP R 820 J 1/16W		R196			R92-1252-05	CHIP R 0 OHM J 1/16W	
R2			RK73GB1J6R8J	CHIP R 6.8 J 1/16W		R197			RK73GB1J331J	CHIP R 330 J 1/16W	
R3			RK73GB1J821J	CHIP R 820 J 1/16W		R198			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R4			RK73EB2B560J	CHIP R 56 J 1/8W		R199,200			RK73GB1J331J	CHIP R 330 J 1/16W	
R5			RK73GB1J103J	CHIP R 10K J 1/16W		R202			RK73FB2A221J	CHIP R 220 J 1/10W	
R6			RK73GB1J102J	CHIP R 1.0K J 1/16W		R204,205			RK73GB1J222J	CHIP R 2.2K J 1/16W	
R7			RK73EB2B471J	CHIP R 470 J 1/8W		R206			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R8			RK73EB2B181J	CHIP R 180 J 1/8W		R251			RK73GB1J470J	CHIP R 47 J 1/16W	
R9			RK73FB2A100J	CHIP R 10 J 1/10W		R253			RK73FB2A101J	CHIP R 100 J 1/10W	
R10			RK73GB1J473J	CHIP R 47K J 1/16W		R254			RK73GB1J820J	CHIP R 82 J 1/16W	
R11			RK73GB1J331J	CHIP R 330 J 1/16W		R255,256			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R12			RK73GB1J681J	CHIP R 680 J 1/16W		R257			R92-1252-05	CHIP R 0 OHM J 1/16W	
R13			RK73GB1J103J	CHIP R 10K J 1/16W		R258			RK73GB1J471J	CHIP R 470 J 1/16W	
R14			RK73GB1J333J	CHIP R 33K J 1/16W		R259			RK73GB1J331J	CHIP R 330 J 1/16W	

## PARTS LIST

RF UNIT (X44-327X-XX)  
FINAL UNIT (X45-365X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
R260			R92-1252-05	CHIP R 0 OHM J 1/16W		D256			HSB88WS	DIODE	
R262,263			RK73GB1J331J	CHIP R 330 J 1/16W		D301-304			1SS388	DIODE	
R264			RK73GB1J470J	CHIP R 47 J 1/16W		IC251		*	TA4107F	MOS IC	
R265			RK73GB1J474J	CHIP R 470K J 1/16W		IC301			BU2099FV	MOS IC	
R266			RK73GB1J100J	CHIP R 10 J 1/16W		Q1		*	KRA318E	DIGITAL TRANSISTOR	
R268			RK73GB1J103J	CHIP R 10K J 1/16W		Q2		*	HN7G01FU	TRANSISTOR	
R269			RK73GB1J392J	CHIP R 3.9K J 1/16W		Q3			2SK2596	FET	
R270			RK73GB1J332J	CHIP R 3.3K J 1/16W		Q4			2SD1757K	TRANSISTOR	
R271			RK73GB1J182J	CHIP R 1.8K J 1/16W		Q51-60		*	KRA318E	DIGITAL TRANSISTOR	
R275			RK73GB1J100J	CHIP R 10 J 1/16W		Q151			KRC402E	DIGITAL TRANSISTOR	
R276			RK73GB1J471J	CHIP R 470 J 1/16W		Q152			RN47A5	TRANSISTOR	
R277			RK73GB1J103J	CHIP R 10K J 1/16W		Q153,154			3SK131(M)	FET	
R278,279			RK73GB1J331J	CHIP R 330 J 1/16W		Q155		*	KRC418E	DIGITAL TRANSISTOR	
R280			RK73GB1J470J	CHIP R 47 J 1/16W		Q156,157			2SK520(K44)	FET	
R281			R92-1252-05	CHIP R 0 OHM J 1/16W		Q158		*	HN7G01FU	TRANSISTOR	
R282			RK73GB1J331J	CHIP R 330 J 1/16W		Q159			2SK2596	FET	
R283			RK73GB1J100J	CHIP R 10 J 1/16W		Q160,161			2SK520(K44)	FET	
R284			RK73GB1J124J	CHIP R 120K J 1/16W		Q251			2SK1830	FET	
R285			RK73GB1J331J	CHIP R 330 J 1/16W		Q252			2SC3356	TRANSISTOR	
R286			RK73GB1J220J	CHIP R 22 J 1/16W		Q253		*	3SK317	FET	
R287			RK73GB1J331J	CHIP R 330 J 1/16W		Q255			2SC3356	TRANSISTOR	
R288			RK73GB1J180J	CHIP R 18 J 1/16W		Q256		*	KRC418E	DIGITAL TRANSISTOR	
R289			RK73GB1J331J	CHIP R 330 J 1/16W		Q301,302			KRC402E	DIGITAL TRANSISTOR	
R290			RK73GB1J470J	CHIP R 47 J 1/16W		TH251			157-101-65001	THERMISTOR	
R291			RK73GB1J101J	CHIP R 100 J 1/16W							
R292			R92-1252-05	CHIP R 0 OHM J 1/16W		<b>FINAL UNIT (X45-365X-XX) 0-11 : KS 2-71 : ES</b>					
R293			RK73GB1J330J	CHIP R 33 J 1/16W		D100		*	B30-2263-15	LED (R/LOWER)	
R294			RK73GB1J221J	CHIP R 220 J 1/16W		C6,7			CK73FB1E104K	CHIP C 0.10UF K	
R295			RK73GB1J471J	CHIP R 470 J 1/16W		C9,10			CK73FB1E104K	CHIP C 0.10UF K	
R296			RK73GB1J220J	CHIP R 22 J 1/16W		C13,14			CK73FB1E104K	CHIP C 0.10UF K	
R297			RK73GB1J470J	CHIP R 47 J 1/16W		C16			CK73FB1H102K	CHIP C 1000PF K	
R298			RK73GB1J681J	CHIP R 680 J 1/16W		C17			CK73FB1E104K	CHIP C 0.10UF K	
R301			RK73GB1J101J	CHIP R 100 J 1/16W		C18			CE04EW1E100M	ELECTRO 10UF 25WV	
R313			RK73GB1J473J	CHIP R 47K J 1/16W		C19			CE04EW1E331M	ELECTRO 330UF 25WV	
R314			R92-1252-05	CHIP R 0 OHM J 1/16W		C21			CK73FB1E104K	CHIP C 0.10UF K	
R315			RK73GB1J473J	CHIP R 47K J 1/16W		C22			CK73FB1H103K	CHIP C 0.010UF K	
R316,317			RK73GB1J103J	CHIP R 10K J 1/16W		C23			CK73FB1E104K	CHIP C 0.10UF K	
R401			R92-1061-05	JUMPER REST 0 OHM		C27			CK73FB1H103K	CHIP C 0.010UF K	
K1			S51-1428-05	RELAY		C28			CK73FB1E104K	CHIP C 0.10UF K	
D1			MA2S111	DIODE		C29			CE04EW1E101M	ELECTRO 100UF 25WV	
D2			V08(G)	DIODE		C30			CE04EW1E331M	ELECTRO 330UF 25WV	
D3,4			RLS245	DIODE		C32			CM73F2H181J	CHIP C 180PF J	
D5			V08(G)	DIODE		C33,34			CE04EW1E100M	ELECTRO 10UF 25WV	
D51,52			HVC131	DIODE		C35,36			CK73FB1E104K	CHIP C 0.10UF K	
D53			LFB01	DIODE		C37,38		*	C93-0716-05	CHIP C 3300PF K	
D54			HVC131	DIODE		C39			CE04EW1E100M	ELECTRO 10UF 25WV	
D55		*	RN731V	DIODE		C40,41			CK73FB1E104K	CHIP C 0.10UF K	
D56-59			1SV312	DIODE		C42			CE04EW1E221M	ELECTRO 220UF 25WV	
D60			HVC131	DIODE		C43-45			CK73FB1E104K	CHIP C 0.10UF K	
D61-69			HSC277	DIODE		C46,47			CM73F2H331J	CHIP C 330PF J	
D151			HSC277	DIODE		C48			CK73FB1E104K	CHIP C 0.10UF K	
D152		*	1SV312	DIODE		C49			CE04EW1E101M	ELECTRO 100UF 25WV	
D154,155			DAN235E	DIODE		C50			CK73FB1E104K	CHIP C 0.10UF K	
D156			HSC277	DIODE		C51,52			C93-0560-05	CHIP C 10PF D	
D251			HSC277	DIODE		C53			C91-2691-05	CERAMIC 470PF 250WV	
D252			DAN235E	DIODE		C54			CE04EW1E471M	ELECTRO 470UF 25WV	
D253			MA2S111	DIODE		C55			CK73FB1E104K	CHIP C 0.10UF K	
D254			RN731V	DIODE							
D255			DAN235E	DIODE							

KH : TS-480HX (K) KS : TS-480SAT (K)  
EH : TS-480HX (E) ES : TS-480SAT (E)

# TS-480HX/480SAT

## PARTS LIST

### FINAL UNIT (X45-365X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Desti-nation	Ref. No.	Address	New parts	Parts No.	Description	Desti-nation
C57			CE04EW1E471M	ELECTRO 470UF 25WV		C306			CC45FSL2H270J	CERAMIC 27PF J	
C58,59			CK73FB1H103K	CHIP C 0.010UF K		C307			CC45FSL2H271J	CERAMIC 270PF J	
C61			CK73FB1E104K	CHIP C 0.10UF K		C309			C93-0569-05	CHIP C 56PF J	
C62			CK73FB1H102K	CHIP C 1000PF K		C310			CC45FSL2H181J	CERAMIC 180PF J	
C63			CK73FB1E104K	CHIP C 0.10UF K		C311			CK73FB1H103K	CHIP C 0.010UF K	
C64			CE04EW1E100M	ELECTRO 10UF 25WV		C312			C93-0554-05	CHIP C 4.0PF C	
C65			CK73FB1H102K	CHIP C 1000PF K		C352			CC45FSL2H101J	CERAMIC 100PF J	
C66			CK73FB1H103K	CHIP C 0.010UF K		C354			C93-0558-05	CHIP C 8.0PF D	
C67		*	C90-4116-05	ELECTRO 22UF 16WV		C355			CC45FSL2H271J	CERAMIC 270PF J	
C68			CK73FB1H103K	CHIP C 0.010UF K		C356			CC45FSL2H470J	CERAMIC 47PF J	
C69			CK73FB1H102K	CHIP C 1000PF K		C357			CC45FSL2H151J	CERAMIC 150PF J	
C70			C93-0568-05	CHIP C 47PF J		C359			CK73FB1H103K	CHIP C 0.010UF K	
C71			CM73F2H221J	CHIP C 220PF J		C402			CC45FSL2H330J	CERAMIC 33PF J	
C72			CE04EW1HR22M	ELECTRO 0.22UF 50WV		C403			CC45FSL2H560J	CERAMIC 56PF J	
C73			CK73FB1H103K	CHIP C 0.010UF K		C404			CC45FSL2H121J	CERAMIC 120PF J	
C74,75		*	C93-0716-05	CHIP C 3300PF K		C405			CC45FSL2H180J	CERAMIC 18PF J	
C76			CK73FB1H103K	CHIP C 0.010UF K		C407			CC45FSL2H151J	CERAMIC 150PF J	
C77			CM73F2H271J	CHIP C 270PF J		C408			CC45FSL2H050C	CERAMIC 5.0PF C	
C78			CK73FB1H102K	CHIP C 1000PF K		C410			CC45FSL2H820J	CERAMIC 82PF J	
C79			CK73FB1H103K	CHIP C 0.010UF K		C411			CK73FB1H103K	CHIP C 0.010UF K	
C80			CK73FB1H102K	CHIP C 1000PF K		C412			C93-0562-05	CHIP C 15PF J	
C81			CK73FB1E104K	CHIP C 0.10UF K		C413			C93-0563-05	CHIP C 18PF J	
C90-93			CK45FB1H103K	CERAMIC 0.010UF K		C451			CK73FB1H103K	CHIP C 0.010UF K	
C94			C93-0572-05	CHIP C 100PF J		C452			CC45FSL2H220J	CERAMIC 22PF J	
C95			C93-0568-05	CHIP C 47PF J		C454			C93-0555-05	CHIP C 5.0PF C	
C96			C93-0572-05	CHIP C 100PF J		C456			CC45FSL2H560J	CERAMIC 56PF J	
C97			C93-0568-05	CHIP C 47PF J		C458			C93-0563-05	CHIP C 18PF J	
C102			CM73F2H102J	CHIP C 1000PF J		C459			CC45FSL2H560J	CERAMIC 56PF J	
C103			CM73F2H561J	CHIP C 560PF J		C461			C93-0563-05	CHIP C 18PF J	
C104			CC45FSL2H680J	CERAMIC 68PF J		C462			CC45FSL2H220J	CERAMIC 22PF J	
C105			CM73F2H102J	CHIP C 1000PF J		C463			CK73FB1H103K	CHIP C 0.010UF K	
C106			CM73F2H821J	CHIP C 820PF J		C502			CK73FB1H102K	CHIP C 1000PF K	
C107			CC45FSL2H121J	CERAMIC 120PF J		C503			CK73FB1H103K	CHIP C 0.010UF K	
C108			CC45FSL2H680J	CERAMIC 68PF J		C504			CC73FCH1H680J	CHIP C 68PF J	
C109			CM73F2H102J	CHIP C 1000PF J		C505			CK73FB1E104K	CHIP C 0.10UF K	
C111			CK73FB1H103K	CHIP C 0.010UF K		C506			CK73FB1H102K	CHIP C 1000PF K	
C152			CM73F2H561J	CHIP C 560PF J		C507			CC45FCH2H030C	CERAMIC 3.0PF C	
C154			CC45FSL2H331J	CERAMIC 330PF J		C508			CC73FCH1H560J	CHIP C 56PF J	
C155			CM73F2H102J	CHIP C 1000PF J		C509			CK73FB1H102K	CHIP C 1000PF K	
C157			CC45FSL2H151J	CERAMIC 150PF J		C511-522			CK73FB1H103K	CHIP C 0.010UF K	
C158			CM73F2H561J	CHIP C 560PF J		C523			CK73FB1H102K	CHIP C 1000PF K	
C159			CK73FB1H103K	CHIP C 0.010UF K		C525,526			CK73FB1H103K	CHIP C 0.010UF K	
C202			CC45FSL2H181J	CERAMIC 180PF J		C527			CE04EW1C470M	ELECTRO 47UF 16WV	
C203,204			CC45FSL2H121J	CERAMIC 120PF J		C528			CK73FB1H103K	CHIP C 0.010UF K	
C205			CM73F2H561J	CHIP C 560PF J		C529			CC73FCH1H470J	CHIP C 47PF J	
C206			C93-0570-05	CHIP C 68PF J		C530			CK73FB1H103K	CHIP C 0.010UF K	
C207			C93-0569-05	CHIP C 56PF J		C531			CC73FCH1H470J	CHIP C 47PF J	
C208			CM73F2H681J	CHIP C 680PF J		C535			CK73FB1H103K	CHIP C 0.010UF K	
C209			C93-0567-05	CHIP C 39PF J		C536			CC73FCH1H100D	CHIP C 10PF D	
C210			CC45FSL2H391J	CERAMIC 390PF J		C537			CC73FCH1H080D	CHIP C 8.0PF D	
C211			CK73FB1H103K	CHIP C 0.010UF K		C801			CK73FB1H102K	CHIP C 1000PF K	
C212			C93-0570-05	CHIP C 68PF J		C802			CK73FB1E104K	CHIP C 0.10UF K	
C252			CC45FSL2H151J	CERAMIC 150PF J		C803,804			CK73FB1H103K	CHIP C 0.010UF K	
C254			CC45FSL2H470J	CERAMIC 47PF J		C805			CK73FB1E104K	CHIP C 0.10UF K	
C255,256			CC45FSL2H221J	CERAMIC 220PF J		C806,807			CK73FB1H103K	CHIP C 0.010UF K	
C257			C93-0560-05	CHIP C 10PF D		C808			CK73FB1E104K	CHIP C 0.10UF K	
C258			CC45FSL2H101J	CERAMIC 100PF J		C809-814			CK73FB1H103K	CHIP C 0.010UF K	
C259			CC45FSL2H271J	CERAMIC 270PF J		C815			CK73FB1E104K	CHIP C 0.10UF K	
C260			CK73FB1H103K	CHIP C 0.010UF K		C816-821			CK73FB1H103K	CHIP C 0.010UF K	
C304			CC45FSL2H181J	CERAMIC 180PF J		C822			CK73FB1E104K	CHIP C 0.10UF K	



## PARTS LIST

FINAL UNIT (X45-365X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Desti-nation	Ref. No.	Address	New parts	Parts No.	Description	Desti-nation
C823,824			C91-3115-05	HV CAP 10PF 2KV		L14			L39-1434-05	TOROIDAL COIL	
C825,826			CK73FB1H103K	CHIP C 0.010UF K		L15			L39-1450-05	TOROIDAL COIL	
C827-832			C91-3115-05	HV CAP 10PF 2KV		L16,17			L33-0699-05	CHOKE COIL	
C833-836			CK73FB1H103K	CHIP C 0.010UF K		L18			L39-1451-05	TOROIDAL COIL	
C837-844			C91-3115-05	HV CAP 10PF 2KV		L19			L40-4795-34	SMALL FIXED INDUCTOR (4.7UH)	
C845-848			CK73FB1H103K	CHIP C 0.010UF K		L20			L33-0651-05	CHOKE COIL	
C849,850			C91-3126-05	HV CAP 10PF 3KV		L21		*	L39-1490-05	TOROIDAL COIL	
C851-854			CK73FB1H103K	CHIP C 0.010UF K		L24			L33-0617-15	CHOKE COIL	
C855,856			C91-3127-05	HV CAP 18PF 3KV		L25,26			L92-0131-05	FERRITE CHIP	
C857-860			CK73FB1H103K	CHIP C 0.010UF K		L27			L34-1231-15	AIR-CORE COIL	
C861-864			C91-3127-05	HV CAP 18PF 3KV		L28		*	L39-1485-05	TOROIDAL COIL	
C865-868			CK73FB1H103K	CHIP C 0.010UF K		L29			L92-0131-05	FERRITE CHIP	
C869-872			C91-3123-05	HV CAP 150PF 3KV		L30-35			L33-0699-05	CHOKE COIL	
C873-876			CK73FB1H103K	CHIP C 0.010UF K		L36			L92-0149-05	FERRITE CHIP	
C877,878			C91-3123-05	HV CAP 150PF 3KV		L90,91			L39-0421-04	COIL	
C879-882			CK73FB1H103K	CHIP C 0.010UF K		L101			L40-4705-34	SMALL FIXED INDUCTOR (47UH)	
C883,884			C91-3123-05	HV CAP 150PF 3KV		L102			L39-1259-05	TOROIDAL COIL	
C885-887			CK73FB1H103K	CHIP C 0.010UF K		L103			L39-1260-05	TOROIDAL COIL	
C888			C91-3123-05	HV CAP 150PF 3KV		L151			L40-4705-34	SMALL FIXED INDUCTOR (47UH)	
C889			CK73FB1H103K	CHIP C 0.010UF K		L152			L39-1405-05	TOROIDAL COIL	
C890			C91-3123-05	HV CAP 150PF 3KV		L153			L39-1225-05	TOROIDAL COIL	
C891,892			CK73FB1H103K	CHIP C 0.010UF K	KS	L201			L40-4705-34	SMALL FIXED INDUCTOR (47UH)	
C893,894			CK73FB1E104K	CHIP C 0.10UF K		L202			L39-1266-05	TOROIDAL COIL	
C895-910			CK73FB1H103K	CHIP C 0.010UF K		L203,204			L39-1223-05	TOROIDAL COIL	
TC501			C05-0031-15	CERAMIC TRIMMER CAP (10P)		L251			L40-4705-34	SMALL FIXED INDUCTOR (47UH)	
CN1			E04-0154-05	PIN SOCKET		L252,253			L39-1221-05	TOROIDAL COIL	
CN2			E40-5978-05	FLAT CABLE CONNECTOR		L301			L40-4705-34	SMALL FIXED INDUCTOR (47UH)	
CN3			E40-5608-05	PIN ASSY		L302			L34-1278-05	AIR-CORE COIL	
CN4			E40-5607-05	PIN ASSY		L303,304			L39-1221-05	TOROIDAL COIL	
CN5			E40-3246-05	PIN ASSY		L351			L40-4705-34	SMALL FIXED INDUCTOR (47UH)	
CN8			E40-3252-05	PIN ASSY		L352			L34-1279-05	AIR-CORE COIL	
CN9			E40-3246-05	PIN ASSY		L353			L34-1280-05	AIR-CORE COIL	
CN11			E04-0154-05	PIN SOCKET		L401			L40-4705-34	SMALL FIXED INDUCTOR (47UH)	
CN12,13			E23-0996-05	TEST TERMINAL		L402			L34-4661-05	AIR-CORE COIL	
CN101			E40-5734-05	FLAT CABLE CONNECTOR		L403,404			L34-1281-05	AIR-CORE COIL	
CN102			E04-0191-05	PIN SOCKET		L405			L92-0131-05	FERRITE CHIP	
CN501			E40-5739-05	FLAT CABLE CONNECTOR		L451			L40-4705-34	SMALL FIXED INDUCTOR (47UH)	
CN502			E40-5758-05	FLAT CABLE CONNECTOR		L452			L34-4662-05	AIR-CORE COIL	
CN503-505			E04-0190-05	PIN SOCKET		L453			L34-4491-05	AIR-CORE COIL	
CN819,820			E04-0154-05	PIN SOCKET		L454			L34-1359-05	AIR-CORE COIL	
W1		*	E37-1056-05	LEAD WIRE WITH TERMINAL	KS	L455			L92-0131-05	FERRITE CHIP	
W1		*	E37-1104-05	LEAD WIRE WITH TERMINAL	ES	L501			L40-1021-33	SMALL FIXED INDUCTOR	
F1			F53-0093-05	FUSE		L502			L39-0480-15	TOROIDAL COIL	
F2			F53-0108-05	FUSE		L503			L40-1005-85	SMALL FIXED INDUCTOR (10UH)	
F3			F06-4027-05	FUSE (BLADE) (4A/32V)		L504			L40-1021-33	SMALL FIXED INDUCTOR	
CN6,7			J13-0410-05	FUSE HOLDER		L505			L39-1442-05	TOROIDAL COIL	
-			L92-0104-05	TROIDAL CORE		L506			L39-1443-05	TOROIDAL COIL	
-			L92-0105-05	TROIDAL CORE		L507-510			L40-4705-34	SMALL FIXED INDUCTOR (47UH)	
-			L92-0107-05	TROIDAL CORE		L511		*	L41-1585-09	SMALL FIXED INDUCTOR	
-			L92-0108-05	TROIDAL CORE		L801-803			L39-1441-05	TOROIDAL COIL	
L1			L40-1505-34	SMALL FIXED INDUCTOR (15UH)		L804			L40-1001-12	SMALL FIXED INDUCTOR	
L2			L40-1005-34	SMALL FIXED INDUCTOR (10UH)		L805			L39-1441-05	TOROIDAL COIL	
L6			L92-0149-05	FERRITE CHIP		L806,807			L39-1440-05	TOROIDAL COIL	
L7		*	L39-1488-05	TOROIDAL COIL		L808			L40-4705-34	SMALL FIXED INDUCTOR (47UH)	
L8			L92-0131-05	FERRITE CHIP		L809			L34-4633-05	AIR-CORE COIL	
L11			L33-0699-05	CHOKE COIL		L810			L40-4705-34	SMALL FIXED INDUCTOR (47UH)	
L12			L40-1001-12	SMALL FIXED INDUCTOR		L811			L34-4630-05	AIR-CORE COIL	
L13		*	L39-1491-15	TOROIDAL COIL		L812			L40-4705-34	SMALL FIXED INDUCTOR (47UH)	
						L813			L34-4490-05	AIR-CORE COIL	
						L814			L40-4705-34	SMALL FIXED INDUCTOR (47UH)	

KH : TS-480HX (K)

KS : TS-480SAT (K)

EH : TS-480HX (E)

ES : TS-480SAT (E)

# TS-480HX/480SAT

## PARTS LIST

### FINAL UNIT (X45-365X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
L815			L34-4490-05	AIR-CORE COIL	KS	R512,513			RK73FB2A104J	CHIP R 100K J 1/10W	KS
L816			L40-4705-34	SMALL FIXED INDUCTOR (47UH)		R514,515			RK73FB2A103J	CHIP R 10K J 1/10W	
L817			L34-4628-05	AIR-CORE COIL		R516,517			RK73FB2A152J	CHIP R 1.5K J 1/10W	
L818			L40-4705-34	SMALL FIXED INDUCTOR (47UH)		R518,519			RK73FB2A102J	CHIP R 1.0K J 1/10W	
L819			L34-4490-05	AIR-CORE COIL		R520,521			RK73FB2A105J	CHIP R 1.0M J 1/10W	
L820			L40-4705-34	SMALL FIXED INDUCTOR (47UH)		R530			RK73FB2A153J	CHIP R 15K J 1/10W	
L821			L34-4490-05	AIR-CORE COIL		R531-534			RK73FB2A101J	CHIP R 100 J 1/10W	
L822-838			L40-4705-34	SMALL FIXED INDUCTOR (47UH)		R535-538			RK73FB2A104J	CHIP R 100K J 1/10W	
L891			L40-4705-34	SMALL FIXED INDUCTOR (47UH)		R539			RK73FB2A103J	CHIP R 10K J 1/10W	
R1,2			RK73FB2A470J	CHIP R 47 J 1/10W		R550			RK73FB2A391J	CHIP R 390 J 1/10W	
R3			RK73FB2A331J	CHIP R 330 J 1/10W		R552			RK73FB2A472J	CHIP R 4.7K J 1/10W	
R4			RK73FB2A470J	CHIP R 47 J 1/10W		R553			RK73FB2A182J	CHIP R 1.8K J 1/10W	
R5			RK73FB2A100J	CHIP R 10 J 1/10W		R554			R92-1061-05	JUMPER REST 0 OHM	
R7,8			RK73FB2A470J	CHIP R 47 J 1/10W		R891			RK73FB2A471J	CHIP R 470 J 1/10W	
R10			RK73FB2A221J	CHIP R 220 J 1/10W	KS	VR1-3			R12-6737-05	TRIMMING POT. (3.3K)	
R11			RK73FB2A100J	CHIP R 10 J 1/10W		VR501			R12-6730-05	TRIMMING POT. (220)	
R12			RK73FB2A122J	CHIP R 1.2K J 1/10W		VR502			R12-6742-05	TRIMMING POT. (22K)	
R14			RK73FB2A470J	CHIP R 47 J 1/10W		W501-506			R92-0150-05	JUMPER REST 0 OHM	
R15			RK73FB2A220J	CHIP R 22 J 1/10W		K101,102			S76-0423-05	RELAY	
R16			RK73FB2A391J	CHIP R 390 J 1/10W		K151,152			S76-0423-05	RELAY	
R17			RK73FB2A102J	CHIP R 1.0K J 1/10W		K201,202			S76-0423-05	RELAY	
R18			RK73FB2A332J	CHIP R 3.3K J 1/10W		K251,252			S76-0423-05	RELAY	
R19			RK73FB2A102J	CHIP R 1.0K J 1/10W		K301,302			S76-0423-05	RELAY	
R20			RK73FB2A562J	CHIP R 5.6K J 1/10W		K351,352			S76-0423-05	RELAY	
R21,22			RK73FB2A470J	CHIP R 47 J 1/10W		K401,402			S51-1420-05	RELAY	
R23			RS14DB3D101J	FL-PROOF RS 100 J 2W		K451,452			S51-1420-05	RELAY	
R24			RK73EB2B391J	CHIP R 390 J 1/8W		K501			S51-1429-05	RELAY	
R25			R92-3510-05	CHIP R 2.2 J 1W		K502,503			S76-0424-05	RELAY	
R28			R92-3510-05	CHIP R 2.2 J 1W	KS	K801-808			S76-0415-05	RELAY	
R29,30			R92-3511-05	CHIP R 8.2 J 1/2W		K809-824			S76-0419-05	RELAY	
R31,32			R92-1240-05	CHIP R 10 J 1/4W		K891			S76-0415-05	RELAY	
R33			RK73FB2A103J	CHIP R 10K J 1/10W		D1,2			MA27-B	VARISTOR	
R34			RK73FB2A223J	CHIP R 22K J 1/10W		D3			ZSH5MA27	SURGE ABSORBER	
R35	*		R92-3559-05	METAL FILM R 0.01 J 10W		D4			1SS355	DIODE	
R36			R92-1274-05	CHIP R 56 J 1/2W		D101			1SS355	DIODE	
R37			R92-0696-05	CHIP R 33 J 1/4W		D151			1SS355	DIODE	
R38			RK73FB2A223J	CHIP R 22K J 1/10W		D201			1SS355	DIODE	
R39			RK73FB2A103J	CHIP R 10K J 1/10W		D251			1SS355	DIODE	
R42			RK73FB2A470J	CHIP R 47 J 1/10W		D301			1SS355	DIODE	
R47		*	R92-3574-05	RESISTOR 0.1 J 2W		D351			1SS355	DIODE	
R49			RK73FB2A223J	CHIP R 22K J 1/10W		D401			1SS355	DIODE	
R50			RK73FB2A103J	CHIP R 10K J 1/10W	KS	D451			1SS355	DIODE	
R51			RK73FB2A681J	CHIP R 680 J 1/10W		D501,502			1SS348	DIODE	
R52			RK73FB2A822J	CHIP R 8.2K J 1/10W		D503			1SS355	DIODE	
R53			R92-2018-05	CHIP R 560 J 1/2W		D504,505			HSM88AS	DIODE	
R54			RS14DB3A101J	FL-PROOF RS 100 J 1W		D506,507			1SS355	DIODE	
R55			RK73FB2A100J	CHIP R 10 J 1/10W		D508,509			DSA301LA	DIODE	
R56-61			RK73EB2B1R0J	CHIP R 1.0 J 1/8W		D801-824			1SS355	DIODE	
R90,91			RS14DB3F820J	FL-PROOF RS 82 J 3W		D891			1SS355	DIODE	
R92			RS14DB3A4R7J	FL-PROOF RS 4.7 J 1W		IC1			TA7805F	MOS IC	
R101-105			R92-0679-05	CHIP R 0 OHM		IC2			TA7808F	ANALOG IC	
R501			RK73FB2A100J	CHIP R 10 J 1/10W	KS	IC501			BU2099FV	MOS IC	
R502			R92-0686-05	CHIP R 33 J 1/2W		IC502			TA75S393F	MOS IC	
R503			R92-1212-05	CHIP R 27 J 1/2W		IC503			TC7WH74FU	MOS IC	
R504			RK73FB2A102J	CHIP R 1.0K J 1/10W		IC509,510			TC7SHU04F	MOS IC	
R505			R92-1316-05	CHIP R 39 J 1W		IC801-803			UPD6345GS	MOS IC	
R506,507			RK73FB2A101J	CHIP R 100 J 1/10W		IC804,805			TC7WT125FU	MOS IC	
R508,509			RK73FB2A102J	CHIP R 1.0K J 1/10W		Q1			2SK2596	FET	
R510,511			RK73FB2A101J	CHIP R 100 J 1/10W		Q2			2SK2595	FET	

## PARTS LIST

FINAL UNIT (X45-365X-XX)

FINAL UNIT (X45-366X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Desti-nation	Ref. No.	Address	New parts	Parts No.	Description	Desti-nation
Q3			2SC3421(Y)	TRANSISTOR		C75			CE04EW1HR22M	ELECTRO 0.22UF 50WV	
Q4,5			2SC2782	TRANSISTOR		C76-78			CK45FB1H103K	CERAMIC 0.010UF K	
Q6		*	SI7445DP	FET		C79			CK73FB1E104K	CHIP C 0.10UF K	
Q7			DTC114EKA	DIGITAL TRANSISTOR		C80			CM73F2H331J	CHIP C 330PF J	
Q8,9			2SD1757K	TRANSISTOR		C81			CM73F2H391J	CHIP C 390PF J	
Q10			2SJ305	FET		C102			CM73F2H102J	CHIP C 1000PF J	
Q11			DTC114EKA	DIGITAL TRANSISTOR		C103			CM73F2H561J	CHIP C 560PF J	
Q501-505			FMA5A	TRANSISTOR		C104			C93-0570-05	CHIP C 68PF J	
Q506,507			2SK208(GR)	FET		C105			CM73F2H102J	CHIP C 1000PF J	
Q508			RN47A5	TRANSISTOR		C106			CM73F2H821J	CHIP C 820PF J	
Q891			DTC114EKA	DIGITAL TRANSISTOR	KS	C107			CC45FSL2H121J	CERAMIC 120PF J	
TH1			157-153-53002	THERMISTOR		C108			C93-0570-05	CHIP C 68PF J	
-			212-1021-05	INSULATING TUBE		C109			CM73F2H102J	CHIP C 1000PF J	
FINAL UNIT (X45-366X-XX) 0-00 : KH 2-71 : EH						C111			CK73FB1H103K	CHIP C 0.010UF K	
D100		*	B30-2263-15	LED (R)		C152			CM73F2H561J	CHIP C 560PF J	
C4,5			CK73FB1E104K	CHIP C 0.10UF K		C153			C93-0565-05	CHIP C 27PF J	
C8			CK73FB1E104K	CHIP C 0.10UF K		C154			CC45FSL2H221J	CERAMIC 220PF J	
C10-12			CK73FB1E104K	CHIP C 0.10UF K		C155			CM73F2H102J	CHIP C 1000PF J	
C13			CK73FB1C105K	CHIP C 1.0UF K		C156			CC45FSL2H151J	CERAMIC 150PF J	
C14			CK73FB1E104K	CHIP C 0.10UF K		C158			CC45FSL2H101J	CERAMIC 100PF J	
C15			CK73FB1H102K	CHIP C 1000PF K		C159			CM73F2H681J	CHIP C 680PF J	
C17			CK73FB1E104K	CHIP C 0.10UF K		C160			CK73FB1H103K	CHIP C 0.010UF K	
C18			CE04EW1E100M	ELECTRO 10UF 25WV		C202			CM73F2H221J	CHIP C 220PF J	
C20			CE04EW1E471M	ELECTRO 470UF 25WV		C203,204			C93-0572-05	CHIP C 100PF J	
C21,22			CK73FB1E104K	CHIP C 0.10UF K		C205			C93-0571-05	CHIP C 82PF J	
C23			CK73FB1E103K	CHIP C 0.010UF K		C206			C93-0570-05	CHIP C 68PF J	
C27		*	C90-4116-05	ELECTRO 22UF 25WV		C207			CM73F2H471J	CHIP C 470PF J	
C29			CK73FB1E104K	CHIP C 0.10UF K		C208			C93-0570-05	CHIP C 68PF J	
C31,32			CK73FB1E103K	CHIP C 0.010UF K		C209			C93-0569-05	CHIP C 56PF J	
C34			CE04EW1E331M	ELECTRO 330UF 25WV		C210			CM73F2H561J	CHIP C 560PF J	
C35			CM73F2H561J	CHIP C 560PF J		C211			C93-0572-05	CHIP C 100PF J	
C36,37			CE04EW1E100M	ELECTRO 10UF 25WV		C212			C93-0567-05	CHIP C 39PF J	
C38,39			CK73FB1E104K	CHIP C 0.10UF K		C213			CM73F2H331J	CHIP C 330PF J	
C40,41		*	C93-0716-05	CHIP C 3300PF K		C214			C93-0563-05	CHIP C 18PF J	
C42			CE04EW1E100M	ELECTRO 10UF 25WV		C215			CK73FB1H103K	CHIP C 0.010UF K	
C43,44			CK73FB1E104K	CHIP C 0.10UF K		C253			C93-0570-05	CHIP C 68PF J	
C46-48			CK73FB1E104K	CHIP C 0.10UF K		C254			C93-0567-05	CHIP C 39PF J	
C49			CM73F2H391J	CHIP C 390PF J		C255			CC45FSL2H391J	CERAMIC 390PF J	
C50			CM73F2H331J	CHIP C 330PF J		C256			C93-0567-05	CHIP C 39PF J	
C51			CK73FB1E104K	CHIP C 0.10UF K		C257			C93-0566-05	CHIP C 33PF J	
C52			CE04EW1E101M	ELECTRO 100UF 25WV		C259			CC45FSL2H271J	CERAMIC 270PF J	
C53			CK73FB1E104K	CHIP C 0.10UF K		C261			CK73FB1H103K	CHIP C 0.010UF K	
C54			CE04EW1E471M	ELECTRO 470UF 25WV		C305			CC45FSL2H151J	CERAMIC 150PF J	
C55			CK73FB1E104K	CHIP C 0.10UF K		C306			CC45FSL2H121J	CERAMIC 120PF J	
C56			C91-2691-05	CERAMIC 470PF 250WV		C307,308			C93-0564-05	CHIP C 22PF J	
C57			CK73FB1E104K	CHIP C 0.10UF K		C309			CC45FSL2H151J	CERAMIC 150PF J	
C60			CM73F2H331J	CHIP C 330PF J		C310			CC45FSL2H181J	CERAMIC 180PF J	
C61			CK73FB1H103K	CHIP C 0.010UF K		C311			C93-0564-05	CHIP C 22PF J	
C62			CK73FB1H102K	CHIP C 1000PF K		C313			CC45FSL2H101J	CERAMIC 100PF J	
C63			CE04EW1E471M	ELECTRO 470UF 25WV		C315			CK73FB1H103K	CHIP C 0.010UF K	
C64,65			CK73FB1H103K	CHIP C 0.010UF K		C355			C93-0564-05	CHIP C 22PF J	
C66-71		*	C93-0716-05	CHIP C 3300PF K		C356			CC45FSL2H181J	CERAMIC 180PF J	
C72			CK45FB1H103K	CERAMIC 0.010UF K		C357			C93-0565-05	CHIP C 27PF J	
C73			CK73FB1E104K	CHIP C 0.10UF K		C358			CC45FSL2H221J	CERAMIC 220PF J	
C74			CK73FB1H103K	CHIP C 0.010UF K		C359			C93-0568-05	CHIP C 47PF J	
						C360			C93-0560-05	CHIP C 10PF D	
						C362			CC45FSL2H151J	CERAMIC 150PF J	
						C363			CK73FB1H103K	CHIP C 0.010UF K	
						C402			CC45FSL2H151J	CERAMIC 150PF J	
						C403			C93-0570-05	CHIP C 68PF J	

KH : TS-480HX (K) KS : TS-480SAT (K)

EH : TS-480HX (E) ES : TS-480SAT (E)

# TS-480HX/480SAT

## PARTS LIST

### FINAL UNIT (X45-366X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination
C406			C93-0563-05	CHIP C 18PF J	
C408			CC45FSL2H181J	CERAMIC 180PF J	
C409			C93-0560-05	CHIP C 10PF D	
C410			C93-0555-05	CHIP C 5.0PF C	
C412			C93-0571-05	CHIP C 82PF J	
C413			CK73FB1H103K	CHIP C 0.010UF K	
C451			CK73FB1H103K	CHIP C 0.010UF K	
C452			C93-0567-05	CHIP C 39PF J	
C453			C93-0565-05	CHIP C 27PF J	
C454			C93-0571-05	CHIP C 82PF J	
C455			C93-0562-05	CHIP C 15PF J	
C456			C93-0556-05	CHIP C 6.0PF D	
C457			C93-0572-05	CHIP C 100PF J	
C459			C93-0568-05	CHIP C 47PF J	
C460			CK73FB1H103K	CHIP C 0.010UF K	
C461,462			C93-0569-05	CHIP C 56PF J	
C463			C93-0567-05	CHIP C 39PF J	
C464			C93-0555-05	CHIP C 5.0PF C	
C465			C93-0565-05	CHIP C 27PF J	
C501			CK73FB1H102K	CHIP C 1000PF K	
C502			CK73FB1H103K	CHIP C 0.010UF K	
C503			CC73FCH1H680J	CHIP C 68PF J	
C504			CK73FB1E104K	CHIP C 0.10UF K	
C505			CK73FB1H102K	CHIP C 1000PF K	
C506			CC45FCH2H030C	CERAMIC 3.0PF C	
C507			CC73FCH1H560J	CHIP C 56PF J	
C508			CK73FB1H102K	CHIP C 1000PF K	
C509,510			CK73FB1H103K	CHIP C 0.010UF K	
C511,512			CC73FCH1H470J	CHIP C 47PF J	
C535			CK73FB1H103K	CHIP C 0.010UF K	
C536			CC73GCH1H080D	CHIP C 8.0PF D	
C800			CM73F2H391J	CHIP C 390PF J	
C801			CM73F2H560J	CHIP C 56PF J	
C803			CE04EW1E100M	ELECTRO 10UF 25WV	
C804			CK73FB1E104K	CHIP C 0.10UF K	
C805			CM73F2H561J	CHIP C 560PF J	
C806			CK73FB1E104K	CHIP C 0.10UF K	
C807			CE04EW1E100M	ELECTRO 10UF 25WV	
C808,809		*	C93-0716-05	CHIP C 3300PF K	
C810			CK73FB1E104K	CHIP C 0.10UF K	
C811			CM73F2H391J	CHIP C 390PF J	
C812			CM73F2H331J	CHIP C 330PF J	
C814			CK73FB1E104K	CHIP C 0.10UF K	
C816			CE04EW1E101M	ELECTRO 100UF 25WV	
C817			CK73FB1E104K	CHIP C 0.10UF K	
C819			CM73F2H560J	CHIP C 56PF J	
C821			C91-2691-05	CERAMIC 470PF 250WV	
C822			CE04EW1E471M	ELECTRO 470UF 25WV	
C823			CM73F2H331J	CHIP C 330PF J	
C824			CK73FB1E104K	CHIP C 0.10UF K	
C826			CK73FB1E104K	CHIP C 0.10UF K	
C827			CK73FB1H103K	CHIP C 0.010UF K	
C828			CE04EW1HR22M	ELECTRO 0.22UF 50WV	
C829			CK45FB1H103K	CERAMIC 0.010UF K	
C830-835		*	C93-0716-05	CHIP C 3300PF K	
C836			CK45FB1H103K	CERAMIC 0.010UF K	
C837			CK73FB1E104K	CHIP C 0.10UF K	
C838			CE04CW1E100M	ELECTRO 10UF 25WV	
C839,840			CK45FB1H103K	CERAMIC 0.01UF K	
C841			C93-0553-05	CHIP C 3.0PF C	
Ref. No.	Address	New parts	Parts No.	Description	Destination
C842			CC73FCH1H180J	CHIP C 18PF J	
C843			CC73FCH1H222J	CHIP C 2200PF J	
TC501			C05-0031-15	CERAMIC TRIMMER CAP (10PF)	
CN1			E04-0154-05	PIN SOCKET	
CN2			E40-5978-05	FLAT CABLE CONNECTOR	
CN3			E40-5608-05	PIN ASSY	
CN4			E40-5607-05	PIN ASSY	
CN5			E40-3246-05	PIN ASSY	
CN8			E40-3252-05	PIN ASSY	
CN9,10			E40-3246-05	PIN ASSY	
CN12,13			E23-0996-05	TEST TERMINAL	
CN101			E40-5734-05	FLAT CABLE CONNECTOR	
CN501			E40-5739-05	FLAT CABLE CONNECTOR	
CN502			E40-5758-05	FLAT CABLE CONNECTOR	
CN503			E04-0190-05	PIN SOCKET	
CN829,830			E23-0996-05	TEST TERMINAL	
W1		*	E37-1056-05	LEAD WIRE WITH TERMINAL	KH
W1		*	E37-1104-05	LEAD WIRE WITH TERMINAL	EH
W101		*	E37-1105-05	LEAD WIRE WITH MINIPIN PLUG	
W801		*	E37-1056-05	LEAD WIRE WITH TERMINAL	KH
W801		*	E37-1104-05	LEAD WIRE WITH TERMINAL	EH
F3			F06-4027-05	FUSE (BLADE) (4A/32V)	
F4			F53-0110-05	FUSE	
F801			F53-0093-05	FUSE	
CN6,7			J13-0410-05	FUSE HOLDER	
-			L92-0104-05	TROIDAL CORE	
-			L92-0105-05	TROIDAL CORE	
L1			L40-4705-34	SMALL FIXED INDUCTOR (47UH)	
L2			L40-1005-34	SMALL FIXED INDUCTOR (10UH)	
L3			L92-0131-05	FERRITE CHIP	
L5			L92-0131-05	FERRITE CHIP	
L6			L92-0149-05	FERRITE CHIP	
L7		*	L39-1483-05	TOROIDAL COIL	
L8			L92-0131-05	FERRITE CHIP	
L9			L33-0699-05	CHOKE COIL	
L11			L92-0131-05	FERRITE CHIP	
L12		*	L39-1482-15	TOROIDAL COIL	
L13			L40-1001-12	SMALL FIXED INDUCTOR	
L14		*	L39-1487-05	TOROIDAL COIL	
L15			L39-1450-05	TOROIDAL COIL	
L16,17			L33-0699-05	CHOKE COIL	
L18			L39-1451-05	TOROIDAL COIL	
L19			L40-4795-34	SMALL FIXED INDUCTOR (4.7UH)	
L20			L33-0651-05	CHOKE COIL	
L21		*	L39-1490-05	TOROIDAL COIL	
L24			L33-0617-15	CHOKE COIL	
L25,26			L92-0131-05	FERRITE CHIP	
L27		*	L39-1485-05	TOROIDAL COIL	
L28			L33-0699-05	CHOKE COIL	
L101			L40-4705-34	SMALL FIXED INDUCTOR (47UH)	
L102			L39-1259-05	TOROIDAL COIL	
L103			L39-1260-05	TOROIDAL COIL	
L151			L40-4705-34	SMALL FIXED INDUCTOR (47UH)	
L152		*	L39-1486-05	TOROIDAL COIL	
L153			L39-0458-05	TOROIDAL COIL	
L201			L40-4705-34	SMALL FIXED INDUCTOR (47UH)	
L202			L39-0463-05	TOROIDAL COIL	
L203,204			L39-1440-05	TOROIDAL COIL	

## PARTS LIST

FINAL UNIT (X45-366X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
L251			L40-4705-34	SMALL FIXED INDUCTOR (47UH)		R25			RK73FB2A332J	CHIP R 3.3K J 1/10W	
L252			L39-0463-05	TOROIDAL COIL		R26			RK73FB2A562J	CHIP R 5.6K J 1/10W	
L253			L39-0460-05	TOROIDAL COIL		R28			RK73EB2B391J	CHIP R 390 J 1/8W	
L301			L40-4705-34	SMALL FIXED INDUCTOR (47UH)		R29			R92-2673-05	CHIP R 1.0 J 1W	
L302			L34-1359-05	AIR-CORE COIL		R32			R92-2673-05	RESISTOR 1.0 J 1W	
L303,304			L39-1492-05	TOROIDAL COIL		R33,34			R92-3511-05	RESISTOR 8.2 J 1/2W	
L351			L40-4705-34	SMALL FIXED INDUCTOR (47UH)		R35,36			R92-1240-05	CHIP R 10 J 1/4W	
L352			L34-1281-05	AIR-CORE COIL		R37			RK73FB2A103J	CHIP R 10K J 1/10W	
L353,354			L34-1279-05	AIR-CORE COIL		R38			RK73FB2A223J	CHIP R 22K J 1/10W	
L401			L40-4705-34	SMALL FIXED INDUCTOR (47UH)		R39	*		R92-3559-05	METAL FILM R 0.01 J 10W	
L402			L34-4661-05	AIR-CORE COIL		R40,41			R92-1245-05	CHIP R 47 J 1/2W	
L403,404			L34-1281-05	AIR-CORE COIL		R42,43			R92-1374-05	CHIP R 47 J 1/4W	
L405			L92-0131-05	FERRITE CHIP		R49-54			RK73EB2B1R0J	CHIP R 1.0 J 1/8W	
L451			L40-4705-34	SMALL FIXED INDUCTOR (47UH)		R55			RK73FB2A100J	CHIP R 10 J 1/10W	
L452			L34-1359-05	AIR-CORE COIL		R56			RK73FB2A4R7J	CHIP R 4.7 J 1/10W	
L453,454			L34-4662-05	AIR-CORE COIL		R58-63			R92-0679-05	CHIP R 0 OHM	
L455			L92-0131-05	FERRITE CHIP		R64,65			RS14DB3F820J	FL-PROOF RS 82 J 3W	
L501			L40-2221-33	SMALL FIXED INDUCTOR		R66			R92-0670-05	CHIP R 0 OHM	
L502			L39-0480-15	TOROIDAL COIL		R67			R92-2536-05	CHIP R 2.2 J 1/4W	
L503			L40-1005-85	SMALL FIXED INDUCTOR (10UH)		R80			RS14DB3D101J	FL-PROOF RS 100 J 2W	
L504			L40-1021-33	SMALL FIXED INDUCTOR		R81			RS14DB3A101J	FL-PROOF RS 100 J 1W	
L505,506			L40-4705-34	SMALL FIXED INDUCTOR (47UH)		R90	*		R92-3574-05	RESISTOR 0.1 J 2W	
L507	*		L41-1585-09	SMALL FIXED INDUCTOR		R101			R92-0679-05	CHIP R 0 OHM	
L802			L39-0477-05	TOROIDAL COIL		R151			R92-0679-05	CHIP R 0 OHM	
L803	*		L39-1487-05	TOROIDAL COIL		R201,202			R92-0679-05	CHIP R 0 OHM	
L804			L39-1450-05	TOROIDAL COIL		R251,252			R92-0679-05	CHIP R 0 OHM	
L805,806			L33-0699-05	CHOKE COIL		R301			R92-0679-05	CHIP R 0 OHM	
L807			L40-4795-34	SMALL FIXED INDUCTOR (4.7UH)		R351			R92-0679-05	CHIP R 0 OHM	
L808			L39-1451-05	TOROIDAL COIL		R401,402			R92-0679-05	CHIP R 0 OHM	
L809			L33-0651-05	CHOKE COIL		R451,452			R92-0679-05	CHIP R 0 OHM	
L810		*	L39-1490-05	TOROIDAL COIL		R501			RK73FB2A100J	CHIP R 10 J 1/10W	
L814			L33-0617-15	CHOKE COIL		R502			R92-1279-05	CHIP R 33 J 1W	
L816,817			L92-0131-05	FERRITE CHIP		R503	*		R92-1305-05	CHIP R 27 J 1W	
L818	*		L39-1479-05	TOROIDAL COIL		R504			RK73FB2A102J	CHIP R 1.0K J 1/10W	
L820	*		L39-1478-05	TOROIDAL COIL		R505-507			RK73FB2A101J	CHIP R 100 J 1/10W	
L821			L33-0699-05	CHOKE COIL		R508-511			RK73FB2A104J	CHIP R 100K J 1/10W	
L822,823			L40-3311-14	SMALL FIXED INDUCTOR		R550			RK73FB2A391J	CHIP R 390 J 1/10W	
R1			RK73FB2A470J	CHIP R 47 J 1/10W		R551			RK73FB2A182J	CHIP R 1.8K J 1/10W	
R2			RK73FB2A331J	CHIP R 330 J 1/10W		R552			RK73FB2A472J	CHIP R 4.7K J 1/10W	
R3			RK73FB2A180J	CHIP R 18 J 1/10W		R553			R92-0670-05	CHIP R 0 OHM	
R4			RK73FB2A470J	CHIP R 47 J 1/10W		R800			RS14DB3A101J	FL-PROOF RS 100 J 1W	
R5			RK73FB2A331J	CHIP R 330 J 1/10W		R803			R92-1318-05	CHIP R 100 J 1W	
R6			RK73FB2A470J	CHIP R 47 J 1/10W		R804			RK73EB2B391J	CHIP R 390 J 1/8W	
R7			RK73FB2A681J	CHIP R 680 J 1/10W		R805			R92-2673-05	CHIP R 1.0 J 1W	
R9			RK73FB2A331J	CHIP R 330 J 1/10W		R808			R92-2673-05	CHIP R 1.0 J 1W	
R10			RK73FB2A221J	CHIP R 220 J 1/10W		R809,810			R92-3511-05	CHIP R 8.2 J 1/2W	
R11			RK73FB2A470J	CHIP R 47 J 1/10W		R811,812			R92-1240-05	CHIP R 10 J 1/4W	
R12			RK73FB2A100J	CHIP R 10 J 1/10W		R813			RK73FB2A103J	CHIP R 10K J 1/10W	
R13			RK73FB2A820J	CHIP R 82 J 1/10W		R814			RK73FB2A223J	CHIP R 22K J 1/10W	
R14			RK73FB2A220J	CHIP R 22 J 1/10W		R816	*		R92-3558-05	METAL FILM R 100 J 10W	
R15			RK73FB2A681J	CHIP R 680 J 1/10W		R817	*		R92-3559-05	METAL FILM R 0.01 J 10W	
R16			RK73FB2A331J	CHIP R 330 J 1/10W		R822			RK73FB2A100J	CHIP R 10 J 1/10W	
R17			RK73FB2A471J	CHIP R 470 J 1/10W		R823			RK73FB2A4R7J	CHIP R 4.7 J 1/10W	
R18			RK73FB2A470J	CHIP R 47 J 1/10W		R824-829			RK73EB2B1R0J	CHIP R 1.0 J 1/8W	
R19			RK73FB2A332J	CHIP R 3.3K J 1/10W		R836-841			R92-0679-05	CHIP R 0 OHM	
R20			RK73FB2A102J	CHIP R 1.0K J 1/10W		R842,843			RS14DB3F820J	FL-PROOF RS 82 J 3W	
R21			RK73FB2A562J	CHIP R 5.6K J 1/10W		VR1,2			R12-6730-05	TRIMMING POT. (220)	
R22			RK73FB2A102J	CHIP R 1.0K J 1/10W		VR3			R12-6737-05	TRIMMING POT. (3.3K)	
R23,24			RK73FB2A470J	CHIP R 47 J 1/10W		VR801			R12-6737-05	TRIMMING POT. (3.3K)	
						VR802			R12-6744-05	TRIMMING POT. (47K)	

KH : TS-480HX (K)    KS : TS-480SAT (K)  
EH : TS-480HX (E)    ES : TS-480SAT (E)

# TS-480HX/480SAT

## PARTS LIST

### FINAL UNIT (X45-366X-XX)

### DISPLAY UNIT (X54-3410-00)

Ref. No.	Address	New parts	Parts No.	Description	Destination
W501-506			R92-0150-05	JUMPER REST 0 OHM	
K101,102			S51-1420-05	RELAY	
K151,152			S51-1420-05	RELAY	
K201,202			S51-1420-05	RELAY	
K251,252			S51-1420-05	RELAY	
K301,302			S51-1420-05	RELAY	
K351,352			S51-1420-05	RELAY	
K401,402			S76-0401-05	RELAY	
K451			S51-1420-05	RELAY	
K452			S76-0401-05	RELAY	
K501			S51-1429-05	RELAY	
K502			S76-0424-05	RELAY	
D2,3			MA27-B	VARIATOR	
D4			1SS355	DIODE	
D5			ZSH5MA27	SURGE ABSORBER	
D6			1SS355	DIODE	
D101			1SS355	DIODE	
D151			1SS355	DIODE	
D201			1SS355	DIODE	
D251			1SS355	DIODE	
D301			1SS355	DIODE	
D351			1SS355	DIODE	
D401			1SS355	DIODE	
D451			1SS355	DIODE	
D501,502			1SS348	DIODE	
D503,504			1SS355	DIODE	
D505,506			DSA301LA	DIODE	
D802,803			MA27-B	VARIATOR	
D806			ZSH5MA27	SURGE ABSORBER	
D807			1SS348	DIODE	
IC1			TA7805F	MOS IC	
IC2,3			TA7808F	ANALOG IC	
IC501			BU2099FV	MOS IC	
Q1			2SK2596	FET	
Q2			2SK2595	FET	
Q3			2SC3421(Y)	TRANSISTOR	
Q4,5			2SC2782	TRANSISTOR	
Q6		*	SI7445DP	FET	
Q7			DTC114EKA	DIGITAL TRANSISTOR	
Q8,9			2SD1757K	TRANSISTOR	
Q501-505			FMA5A	TRANSISTOR	
Q506			RN47A5	TRANSISTOR	
Q803			2SC3421(Y)	TRANSISTOR	
Q804,805			2SC2782	TRANSISTOR	
Q806		*	SI7445DP	FET	
Q807			DTC114EKA	DIGITAL TRANSISTOR	
TH1,2			157-153-53002	THERMISTOR	
-			212-1021-05	INSULATING TUBE	
<b>DISPLAY UNIT (X54-3410-00)</b>					
201	2G	*	B11-1801-03	ILLUMINATION GUIDE	
202	2H	*	B11-1802-14	FILTER	
203	2G	*	B11-1803-04	FILTER	
204	2G	*	B38-0879-05	LCD	
D1-4		*	B30-2270-05	LED (YELLOW)	
D10-13		*	B30-2270-05	LED (YELLOW)	

Ref. No.	Address	New parts	Parts No.	Description	Destination
D14		*	B30-2276-05	LED (R)	
D15			B30-2167-05	LED (GR)	
D16-36			B30-2269-05	LED (YELLOW)	
C1			CK73GB1C104K	CHIP C 0.10UF K	
C2,3			CK73GB1H103K	CHIP C 0.010UF K	
C4			CK73GB1H102K	CHIP C 1000PF K	
C5			CK73GB1C104K	CHIP C 0.10UF K	
C6,7			CK73GB1H103K	CHIP C 0.010UF K	
C8,9			CK73GB1H102K	CHIP C 1000PF K	
C15			C92-0041-05	CHIP-ELE 10UF 10WV	
C16,17			CK73GB1C104K	CHIP C 0.10UF K	
C18			C92-0041-05	CHIP-ELE 10UF 10WV	
C19,20			CK73GB1C104K	CHIP C 0.10UF K	
C21,22			CC73GCH1H220J	CHIP C 22PF J	
C23			CK73GB1H102K	CHIP C 1000PF K	
C24			CK73GB1H103K	CHIP C 0.010UF K	
C25			C92-0698-05	ELECTRO 47UF 16WV	
C26			C92-0004-05	CHIP-TAN 1.0UF 16WV	
C27,28			CC73GCH1H101J	CHIP C 100PF J	
C29			CK73GB1C104K	CHIP C 0.10UF K	
C30			CK73GB1H103K	CHIP C 0.010UF K	
C31-33			CK73FB1C105K	CHIP C 1.0UF K	
C34-39			CK73GB1H102K	CHIP C 1000PF K	
C41-44			CK73GB1H102K	CHIP C 1000PF K	
C45,46			CK73FB1C105K	CHIP C 1.0UF K	
C47			CK73GB1C104K	CHIP C 0.10UF K	
205	2G	*	E29-1198-04	INTER CONNECTOR	
CN2			E40-3237-05	PIN ASSY	
CN3,4			E40-5392-05	PIN ASSY	
CN5			E40-3239-05	PIN ASSY	
CN6,7			E40-5409-05	PIN ASSY	
J1		*	E11-0482-05	3.5D PHONE JACK	
J2		*	E58-0506-05	MODULAR JACK	
206	2G	*	G13-1949-04	CUSHION	
207	2G	*	J21-8450-03	HARDWARE FIXTURE	
L1,2			L40-1005-34	SMALL FIXED INDUCTOR (10UH)	
L3			L92-0552-05	FERRITE CHIP	
L5-7			L92-0552-05	FERRITE CHIP	
L8			L33-0742-05	SMALL FIXED INDUCTOR	
X1			L77-1814-05	CRYSTAL RESONATOR (11.0592MHZ)	
CP1,2			RK75GB1J103J	CHIP-COM 10K J 1/16W	
CP3-5			RK75GB1J473J	CHIP-COM 47K J 1/16W	
R1			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R2			RK73FB2A121J	CHIP R 120 J 1/10W	
R3,4			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R5			RK73GB1J473J	CHIP R 47K J 1/16W	
R6			RK73FB2A390J	CHIP R 39 J 1/10W	
R7			RK73FB2A5R6J	CHIP R 5.6 J 1/10W	
R8			R92-0670-05	CHIP R 0 OHM	
R9,10			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R11,12			RK73FB2A560J	CHIP R 56 J 1/10W	
R13			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R14			RK73GB1J473J	CHIP R 47K J 1/16W	
R15-19			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R20,21			R92-1252-05	CHIP R 0 OHM J 1/16W	
R22			RK73GB1J103J	CHIP R 10K J 1/16W	
R23			RK73FB2A271J	CHIP R 270 J 1/10W	



## PARTS LIST

DISPLAY UNIT (X54-3410-00)

TX-RX UNIT (X57-663X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
R25			RK73FB2A221J	CHIP R 220 J 1/10W		C19			CC73GCH1H470J	CHIP C 47PF J	
R26			RK73GB1J473J	CHIP R 47K J 1/16W		C20,21			C92-0628-05	CHIP-TAN 10UF 10WV	
R27			RK73GB1J102J	CHIP R 1.0K J 1/16W		C22			CK73GB1C473K	CHIP C 0.047UF K	
R28			RK73GB1J473J	CHIP R 47K J 1/16W		C23			CK73GB1H102K	CHIP C 1000PF K	
R29			R92-1252-05	CHIP R 0 OHM J 1/16W		C24			CK73GB1H472K	CHIP C 4700PF K	
R30-33			RK73GB1J473J	CHIP R 47K J 1/16W		C25,26			CK73GB1C473K	CHIP C 0.047UF K	
R34			RK73FB2A152J	CHIP R 1.5K J 1/10W		C28			CC73GCH1H390J	CHIP C 39PF J	
R35			RK73FB2A181J	CHIP R 180 J 1/10W		C29			CK73GB1H103K	CHIP C 0.010UF K	
R36			RK73FB2A331J	CHIP R 330 J 1/10W		C30			CK73GB1C473K	CHIP C 0.047UF K	
R37			RK73FB2A181J	CHIP R 180 J 1/10W		C31			CK73GB1H103K	CHIP C 0.010UF K	
R38			RK73GB1J103J	CHIP R 10K J 1/16W		C32			CK73GB1C473K	CHIP C 0.047UF K	
R39			RK73FB2A392J	CHIP R 3.9K J 1/10W		C33			CC73GCH1H040B	CHIP C 4.0PF B	
R40			RK73FB2A681J	CHIP R 680 J 1/10W		C34			CC73GCH1H390J	CHIP C 39PF J	
R41,42			RK73GB1J101J	CHIP R 100 J 1/16W		C35,36			CC73GCH1H331J	CHIP C 330PF J	
R43-45			RK73GB1J102J	CHIP R 1.0K J 1/16W		C37			CK73GB1A105K	CHIP C 1.0UF K	
R47-50			RK73GB1J101J	CHIP R 100 J 1/16W		C38			CK73GB1C473K	CHIP C 0.047UF K	
R51-54			RK73GB1J473J	CHIP R 47K J 1/16W		C39			CK73GB1H103K	CHIP C 0.010UF K	
R55,56			R92-1205-05	CHIP R 120 J 1/4W		C40			CC73GCH1H221J	CHIP C 220PF J	
R57			RK73GB1J473J	CHIP R 47K J 1/16W		C41			CC73GCH1H100D	CHIP C 10PF D	
R58			RK73GB1J104J	CHIP R 100K J 1/16W		C42			CK73GB1C473K	CHIP C 0.047UF K	
R59,60			RK73GB1J102J	CHIP R 1.0K J 1/16W		C43			C92-0628-05	CHIP-TAN 10UF 10WV	
R62			R92-0670-05	CHIP R 0 OHM		C44			CK73GB1C473K	CHIP C 0.047UF K	
R63			RK73FB2A122J	CHIP R 1.2K J 1/10W		C46			CK73GB1C473K	CHIP C 0.047UF K	
VR1		*	R31-0645-05	VARIABLE RESISTOR		C47			CK73GB1H103K	CHIP C 0.010UF K	
VR2		*	R31-0644-05	VARIABLE RESISTOR		C48			CK73GB1H102K	CHIP C 1000PF K	
S1-33		*	S70-0490-05	TACT SWITCH		C49-52			CK73GB1C473K	CHIP C 0.047UF K	
S35		*	S70-0490-05	TACT SWITCH		C53			CK73GB1H103K	CHIP C 0.010UF K	
D5-9			MA2S111	DIODE		C54,55			CK73GB1C473K	CHIP C 0.047UF K	
D37			MA2S111	DIODE		C56			CK73GB1H391K	CHIP C 390PF K	
IC1,2			LC75823W	MOS IC		C57			CK73GB1H471K	CHIP C 470PF K	
IC3		*	30622M8A-7N0GP	MCU		C58			CK73GB1H102K	CHIP C 1000PF K	
IC4,5			TC4S81F	MOS IC		C59			CC73GCH1H680J	CHIP C 68PF J	
IC6			L78LR05B-FA	MOS IC (SIP/5P/16)		C60			CC73GCH1H330J	CHIP C 33PF J	
Q1-6			DTC114EE	DIGITAL TRANSISTOR		C61			CC73GCH1H270J	CHIP C 27PF J	
Q7			2SA1162(Y)	TRANSISTOR		C62			CK73GB1H561K	CHIP C 560PF K	
S34		*	W02-3662-05	ENCODER		C63			CK73GB1H681K	CHIP C 680PF K	
<b>TX-RX UNIT (X57-663X-XX)</b>						C64,65			CC73GCH1H820J	CHIP C 82PF J	
<b>0-11 : KH 0-12 : KS 2-71 : EH 2-72 : ES</b>						C66			CC73GCH1H120J	CHIP C 12PF J	
D621			B30-2001-05	LED (RE/MEN/8)		C67			CC73GCH1H271J	CHIP C 270PF J	
C1			CC73GCH1H080B	CHIP C 8.0PF B		C68			CC73GCH1H331J	CHIP C 330PF J	
C2			CC73GCH1H151J	CHIP C 150PF J		C69			CK73GB1H391K	CHIP C 390PF K	
C3			CC73GCH1H390J	CHIP C 39PF J		C70			CC73GCH1H080B	CHIP C 8.0PF B	
C4			C92-0628-05	CHIP-TAN 10UF 10WV		C71			CC73GCH1H271J	CHIP C 270PF J	
C5			CK73GB1H472K	CHIP C 4700PF K		C72			CK73GB1H102K	CHIP C 1000PF K	
C6			CK73GB1C473K	CHIP C 0.047UF K		C73			CC73GCH1H560J	CHIP C 56PF J	
C8			CK73GB1H103K	CHIP C 0.010UF K		C74			CK73GB1C473K	CHIP C 0.047UF K	
C9			CC73GCH1H050B	CHIP C 5.0PF B		C75			CC73GCH1H120J	CHIP C 12PF J	
C10			CK73GB1C473K	CHIP C 0.047UF K		C76			C92-0628-05	CHIP-TAN 10UF 10WV	
C11			CK73GB1H103K	CHIP C 0.010UF K		C77			CC73GCH1H680J	CHIP C 68PF J	
C12			CK73GB1C473K	CHIP C 0.047UF K		C78			CK73GB1H102K	CHIP C 1000PF K	
C14,15			CK73GB1C473K	CHIP C 0.047UF K		C79			CK73GB1C473K	CHIP C 0.047UF K	
C16			CC73GCH1H470J	CHIP C 47PF J		C80			CK73GB1H102K	CHIP C 1000PF K	
C17			CK73GB1C473K	CHIP C 0.047UF K		C81			CC73GCH1H220J	CHIP C 22PF J	
C18			CK73GB1H103K	CHIP C 0.010UF K		C83			CC73GCH1H180J	CHIP C 18PF J	
						C84			CC73GCH1H100D	CHIP C 10PF D	
						C85			CK73GB1C473K	CHIP C 0.047UF K	
						C86			CC73GCH1H470J	CHIP C 47PF J	
						C87			C92-0628-05	CHIP-TAN 10UF 10WV	
						C88			CK73GB1H472K	CHIP C 4700PF K	
						C89			CK73GB1H102K	CHIP C 1000PF K	

KH : TS-480HX (K) KS : TS-480SAT (K)

EH : TS-480HX (E) ES : TS-480SAT (E)



# TS-480HX/480SAT

## PARTS LIST

### TX-RX UNIT (X57-663X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
C90			CC73GCH1H120J	CHIP C 12PF J		C238			C92-0562-05	CHIP-ELE 330UF 6.3VV	
C91			CK73GB1H472K	CHIP C 4700PF K		C239-241			CK73GB1C104K	CHIP C 0.10UF K	
C92			CC73GCH1H240J	CHIP C 24PF J		C242			C92-0560-05	CHIP-TAN 10UF 6.3VV	
C93			CC73GCH1H220J	CHIP C 22PF J		C243			CK73GB1H103K	CHIP C 0.010UF K	
C94			C92-0001-05	CHIP C 0.1UF 35VV		C244,245			CK73GB1C104K	CHIP C 0.10UF K	
C95			CK73GB1H472K	CHIP C 4700PF K		C246			C92-0562-05	CHIP-ELE 330UF 6.3VV	
C96,97			CK73GB1H102K	CHIP C 1000PF K		C247			C92-0560-05	CHIP-TAN 10UF 6.3VV	
C98			CK73GB1C104K	CHIP C 0.10UF K		C248			CK73GB1C104K	CHIP C 0.10UF K	
C99			C92-0628-05	CHIP-TAN 10UF 10VV		C249			CK73GB1H822K	CHIP C 8200PF K	
C100			CK73GB1H472K	CHIP C 4700PF K		C250			CK73GB1H102K	CHIP C 1000PF K	
C101			CK73GB1H102K	CHIP C 1000PF K		C251			CK73GB1A105K	CHIP C 1.0UF K	
C102			CK73GB1C333J	CHIP C 0.033UF J		C252			C92-0041-05	CHIP-ELE 10UF 10VV	
C103			CK73GB1H102K	CHIP C 1000PF K		C253			CK73GB1C104K	CHIP C 0.10UF K	
C104			CK73GB1H472K	CHIP C 4700PF K		C254			C92-0041-05	CHIP-ELE 10UF 10VV	
C105			C92-0041-05	CHIP-ELE 10UF 10VV		C255			CK73GB1C104K	CHIP C 0.10UF K	
C106			C92-0653-05	CHIP-TAN 0.68UF 10VV		C256			CK73GB1H103K	CHIP C 0.010UF K	
C107			CK73GB1H472K	CHIP C 4700PF K		C257			CK73GB1C104K	CHIP C 0.10UF K	
C108			C92-0628-05	CHIP-TAN 10UF 10VV		C258			C92-0560-05	CHIP-TAN 10UF 6.3VV	
C115			CK73GB1C223K	CHIP C 0.022UF K		C259			CK73GB1H103K	CHIP C 0.010UF K	
C116			CK73GB1H103K	CHIP C 0.010UF K		C260			C92-0560-05	CHIP-TAN 10UF 6.3VV	
C117			CK73GB1C104K	CHIP C 0.10UF K		C261			CK73GB1C104K	CHIP C 0.10UF K	
C118,119			CK73GB1H103K	CHIP C 0.010UF K		C262			C92-0560-05	CHIP-TAN 10UF 6.3VV	
C120			CC73GCH1H101J	CHIP C 100PF J		C263			CK73GB1A105K	CHIP C 1.0UF K	
C121			CC73GCH1H151J	CHIP C 150PF J		C264			CK73GB1H822K	CHIP C 8200PF K	
C122,123			CK73GB1H103K	CHIP C 0.010UF K		C265			CK73GB1H102K	CHIP C 1000PF K	
C124			CK73GB1C473K	CHIP C 0.047UF K		C266			CK73GB1H103K	CHIP C 0.010UF K	
C131-133			CK73GB1H102K	CHIP C 1000PF K		C267			CK73GB1A105K	CHIP C 1.0UF K	
C134,135			CK73GB1H103K	CHIP C 0.010UF K		C268			CK73GB1H103K	CHIP C 0.010UF K	
C136-138			CK73GB1H102K	CHIP C 1000PF K		C269			CK73GB1C104K	CHIP C 0.10UF K	
C139			CK73GB1C104K	CHIP C 0.10UF K		C270			CK73GB1H103K	CHIP C 0.010UF K	
C140			CK45FE2H222P	CERAMIC 2200PF P		C271			C92-0560-05	CHIP-TAN 10UF 6.3VV	
C141			CK73GB1A105K	CHIP C 1.0UF K		C272			CK73GB1A105K	CHIP C 1.0UF K	
C142			CK73GB1H102K	CHIP C 1000PF K		C273			CK73GB1H272K	CHIP C 2700PF K	
C143			CK73GB1A105K	CHIP C 1.0UF K		C274			C92-0560-05	CHIP-TAN 10UF 6.3VV	
C144			CK73GB1H103K	CHIP C 0.010UF K		C275			CK73GB1H471K	CHIP C 470PF K	
C145			C92-0628-05	CHIP-TAN 10UF 10VV		C276			CK73GB1A105K	CHIP C 1.0UF K	
C146,147			CK73GB1A105K	CHIP C 1.0UF K		C279			C92-0560-05	CHIP-TAN 10UF 6.3VV	
C148			C92-0628-05	CHIP-TAN 10UF 10VV		C280			CK73GB1C104K	CHIP C 0.10UF K	
C149			CK73GB1A105K	CHIP C 1.0UF K		C281			C92-0048-05	ELECTRO 100UF 6.3VV	
C150,151			CK73GB1H103K	CHIP C 0.010UF K		C282,283			CK73GB1C104K	CHIP C 0.10UF K	
C152			CK73FB1E104K	CHIP C 0.10UF K		C284,285			CK73GB1H103K	CHIP C 0.010UF K	
C153			CK73GB1H102K	CHIP C 1000PF K		C286			C92-0560-05	CHIP-TAN 10UF 6.3VV	
C171-175			CC73GCH1H101J	CHIP C 100PF J		C287			C92-0048-05	ELECTRO 100UF 6.3VV	
C176-187			CK73GB1H102K	CHIP C 1000PF K		C288			CK73GB1C104K	CHIP C 0.10UF K	
C188			CK73GB1C104K	CHIP C 0.10UF K		C289			CK73GB1H103K	CHIP C 0.010UF K	
C189-194			CC73GCH1H101J	CHIP C 100PF J		C290			CK73GB1A105K	CHIP C 1.0UF K	
C196,197			CK73GB1H102K	CHIP C 1000PF K		C291			CK73GB1H471K	CHIP C 470PF K	
C201,202			CK73GB1H102K	CHIP C 1000PF K		C292			CK73GB1A105K	CHIP C 1.0UF K	
C203-206			CK73FB1C105K	CHIP C 1.0UF K		C293			CK73GB1H272K	CHIP C 2700PF K	
C207			CK73GB1H102K	CHIP C 1000PF K		C294			CK73GB1H103K	CHIP C 0.010UF K	
C208,209			CK73GB1H103K	CHIP C 0.010UF K		C295,296			CK73GB1C104K	CHIP C 0.10UF K	
C210-212			CK73GB1H102K	CHIP C 1000PF K		C297			CK73GB1H103K	CHIP C 0.010UF K	
C214		*	C90-4112-05	ELECTRO 100UF 16VV		C298,299			CK73GB1C104K	CHIP C 0.10UF K	
C217,218			CK73GB1H103K	CHIP C 0.010UF K		C300			CK73GB1H103K	CHIP C 0.010UF K	
C220,221			CK73FB1C105K	CHIP C 1.0UF K		C301,302			CK73GB1C104K	CHIP C 0.10UF K	
C222,223			CK73GB1H102K	CHIP C 1000PF K		C303			C92-0560-05	CHIP-TAN 10UF 6.3VV	
C224-226			CK73GB1H103K	CHIP C 0.010UF K		C304,305			CK73GB1E223K	CHIP C 0.022UF K	
C227,228			CC73GCH1H220J	CHIP C 22PF J		C306			CK73GB1H103K	CHIP C 0.010UF K	
C229,230			CK73GB1H103K	CHIP C 0.010UF K		C307			CK73GB1C104K	CHIP C 0.10UF K	
C232-237			CK73GB1H103K	CHIP C 0.010UF K		C308			CK73GB1H102K	CHIP C 1000PF K	

## PARTS LIST

## TX-RX UNIT (X57-663X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
C309,310			C92-0560-05	CHIP-TAN 10UF 6.3WV		C474			CK73GB1C473K	CHIP C 0.047UF K	
C311			C92-0004-05	CHIP-TAN 1.0UF 16WV		C476			CK73GB1H472K	CHIP C 4700PF K	
C312			CK73GB1C104K	CHIP C 0.10UF K		C477			CC73GCH1H101J	CHIP C 100PF J	
C313			CK73GB1H103K	CHIP C 0.010UF K		C478			CK73GB1H102K	CHIP C 1000PF K	
C314			CC73GCH1H101J	CHIP C 100PF J		C479			CC73GCH1H100D	CHIP C 10PF D	
C315,316			CK73GB1H103K	CHIP C 0.010UF K		C480			CK73GB1A105K	CHIP C 1.0UF K	
C317,318			CC73GCH1H270J	CHIP C 27PF J		C481			CC73GCH1H270J	CHIP C 27PF J	
C320			C92-0560-05	CHIP-TAN 10UF 6.3WV		C482			CC73GCH1H220J	CHIP C 22PF J	
C321			CK73GB1C104K	CHIP C 0.10UF K		C483			CC73GCH1H120J	CHIP C 12PF J	
C322			CK73GB1A105K	CHIP C 1.0UF K		C484			CC73GCH1H150J	CHIP C 15PF J	
C323			CK73GB1H103K	CHIP C 0.010UF K		C485			CC73GCH1H270J	CHIP C 27PF J	
C324			CK73GB1C104K	CHIP C 0.10UF K		C486			CC73GCH1H100D	CHIP C 10PF D	
C325			CK73FB1C105K	CHIP C 1.0UF K		C487			CK73GB1H103K	CHIP C 0.010UF K	
C326			CK73GB1A105K	CHIP C 1.0UF K		C488			CK73GB1H102K	CHIP C 1000PF K	
C327			CK73GB1H103K	CHIP C 0.010UF K		C501			CK73GB1H103K	CHIP C 0.010UF K	
C328			CK73GB1A105K	CHIP C 1.0UF K		C502			CC73GCH1H100D	CHIP C 10PF D	
C329			CK73GB1H103K	CHIP C 0.010UF K		C503			CC73GCH1H020B	CHIP C 2.0PF B	
C351-356			CK73GB1H103K	CHIP C 0.010UF K		C504,505			CK73GB1H103K	CHIP C 0.010UF K	
C357-359			CC73GCH1H101J	CHIP C 100PF J		C506			CC73GCH1H470J	CHIP C 47PF J	
C360			CK73GB1H103K	CHIP C 0.010UF K		C507			CK73GB1H103K	CHIP C 0.010UF K	
C362			CK73GB1C104K	CHIP C 0.10UF K		C508			CC73GCH1H470J	CHIP C 47PF J	
C363-366			CK73GB1H103K	CHIP C 0.010UF K		C509			CK73GB1H103K	CHIP C 0.010UF K	
C367			CK73GB1H102K	CHIP C 1000PF K		C511			C92-0003-05	CHIP-TAN 0.47UF 25WV	
C368-374			CK73GB1C104K	CHIP C 0.10UF K		C512			CK73GB1H103K	CHIP C 0.010UF K	
C375-379			CC73GCH1H101J	CHIP C 100PF J		C514,515			CK73GB1H103K	CHIP C 0.010UF K	
C382			CK73GB1H103K	CHIP C 0.010UF K		C517,518			CK73GB1H103K	CHIP C 0.010UF K	
C383,384			CK73GB1H102K	CHIP C 1000PF K		C519			CK73GB1H102K	CHIP C 1000PF K	
C385			CK73GB1A105K	CHIP C 1.0UF K		C521			CK73GB1A105K	CHIP C 1.0UF K	
C386			CC73GCH1H101J	CHIP C 100PF J		C522			CC73GCH1H100D	CHIP C 10PF D	
C387			CK73GB1A105K	CHIP C 1.0UF K		C523,524			CK73GB1H103K	CHIP C 0.010UF K	
C388			CC73GCH1H101J	CHIP C 100PF J		C525			CK73GB1H102K	CHIP C 1000PF K	
C389			C92-0560-05	CHIP-TAN 10UF 6.3WV		C526			C92-0628-05	CHIP-TAN 10UF 10WV	
C390-393			CC73GCH1H101J	CHIP C 100PF J		C527			CE04EW1E470M	ELECTRO 47UF 25WV	
C394,395			CK73GB1H102K	CHIP C 1000PF K		C528			CK73GB1H103K	CHIP C 0.010UF K	
C397-404			CK73GB1H102K	CHIP C 1000PF K		C529			CC73GCH1H470J	CHIP C 47PF J	
C405-407			CC73GCH1H101J	CHIP C 100PF J		C551,552			CK73GB1C104K	CHIP C 0.10UF K	
C408-410			CK73GB1C104K	CHIP C 0.10UF K		C553			CC73GCH1H270J	CHIP C 27PF J	
C411,412			CK73GB1H103K	CHIP C 0.010UF K		C554			CK73GB1C104K	CHIP C 0.10UF K	
C413			CK73GB1H102K	CHIP C 1000PF K		C555,556			CC73GCH1H271J	CHIP C 270PF J	
C414			C92-0041-05	CHIP-ELE 10UF 10WV		C557			CC73GCH1H391J	CHIP C 390PF J	
C415-417			CK73GB1H102K	CHIP C 1000PF K		C558			CK73GB1H103K	CHIP C 0.010UF K	
C418,419			CK73GB1C104K	CHIP C 0.10UF K		C559			C92-0628-05	CHIP-TAN 10UF 10WV	
C420		*	C90-4114-05	ELECTRO 470UF 16WV		C560			CK73GB1C104K	CHIP C 0.10UF K	
C451			CC73GCH1H121J	CHIP C 120PF J		C561,562			CK73GB1H103K	CHIP C 0.010UF K	
C452			CC73GCH1H820J	CHIP C 82PF J		C563			CK73GB1C104K	CHIP C 0.10UF K	
C453			CC73GCH1H060B	CHIP C 6.0PF B		C564-566			CK73GB1H103K	CHIP C 0.010UF K	
C455,456			CK73GB1C473K	CHIP C 0.047UF K		C567			CC73GCH1H390J	CHIP C 39PF J	
C457,458			CK73GB1A105K	CHIP C 1.0UF K		C568-570			CK73GB1H103K	CHIP C 0.010UF K	
C459			CC73GCH1H180J	CHIP C 18PF J		C571			CK73GB1H102K	CHIP C 1000PF K	
C460			CC73GCH1H120J	CHIP C 12PF J		C572			CC73GCH1H050B	CHIP C 5.0PF B	
C461			CC73GCH1H330J	CHIP C 33PF J		C573			CC73GCH1H221J	CHIP C 220PF J	
C462			CC73GCH1H270J	CHIP C 27PF J		C574			CK73GB1H103K	CHIP C 0.010UF K	
C463,464			CC73GCH1H150J	CHIP C 15PF J		C575			CC73GCH1H390J	CHIP C 39PF J	
C465			CK73GB1H103K	CHIP C 0.010UF K		C576,577			CK73GB1H103K	CHIP C 0.010UF K	
C466,467			CC73GCH1H100D	CHIP C 10PF D		C579			CC73GCH1H150J	CHIP C 15PF J	
C468,469			CK73GB1H103K	CHIP C 0.010UF K		C581			CC73GCH1H470J	CHIP C 47PF J	
C470			CK73GB1H472K	CHIP C 4700PF K		C582			CK73GB1H102K	CHIP C 1000PF K	
C471			CK73GB1H102K	CHIP C 1000PF K		C583			CC73GCH1H030B	CHIP C 3.0PF B	
C472			CK73GB1H472K	CHIP C 4700PF K		C584			CC73GCH1H470J	CHIP C 47PF J	
C473			CC73GCH1H470J	CHIP C 47PF J		C585,586			CK73GB1C104K	CHIP C 0.10UF K	

# TS-480HX/480SAT

## PARTS LIST

### TX-RX UNIT (X57-663X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
C587			CC73GCH1H221J	CHIP C 220PF J		C755			CE04EW1E4R7M	ELECTRO 4.7UF 25WV	
C588			CK73GB1C104K	CHIP C 0.10UF K		C756		*	C90-4112-05	ELECTRO 100UF 16WV	
C589			CC73GCH1H101J	CHIP C 100PF J		C757			CK73FB1E104K	CHIP C 0.10UF K	
C590			CK73GB1C104K	CHIP C 0.10UF K		C758			CK73GB1H103K	CHIP C 0.010UF K	
C591			C92-0665-05	TANTAL 100UF 6.3WV		C759			CK73FB1E104K	CHIP C 0.10UF K	
C592			CK73GB1H102K	CHIP C 1000PF K		C760			CK73FB1C105K	CHIP C 1.0UF K	
C593			CK73GB1H103K	CHIP C 0.010UF K		C761,762			CK73FB1E104K	CHIP C 0.10UF K	
C594-596			CK73GB1A105K	CHIP C 1.0UF K		C763,764			CK73GB1A105K	CHIP C 1.0UF K	
C597			CK73GB1H103K	CHIP C 0.010UF K		C801-804			CK73GB1H102K	CHIP C 1000PF K	
C599			CK73GB1C104K	CHIP C 0.10UF K		C805,806			CK73GB1C104K	CHIP C 0.10UF K	
C600,601			CK73GB1A105K	CHIP C 1.0UF K		C807			CK73GB1H102K	CHIP C 1000PF K	
C602,603			CK73GB1C104K	CHIP C 0.10UF K		C808			C92-0628-05	CHIP-TAN 10UF 10WV	
C604			CC73GCH1H220J	CHIP C 22PF J		C809			CK73GB1H103K	CHIP C 0.010UF K	
C622-624			CK73GB1H103K	CHIP C 0.010UF K		C810			CC73GCH1H330J	CHIP C 33PF J	
C625			CK73GB1C104K	CHIP C 0.10UF K		C811			CK73GB1H103K	CHIP C 0.010UF K	
C626			CK73GB1H102K	CHIP C 1000PF K		C812			C92-0560-05	CHIP-TAN 10UF 6.3WV	
C627,628			CK73GB1H103K	CHIP C 0.010UF K		C813			CK73GB1H103K	CHIP C 0.010UF K	
C629-631			CK73GB1C104K	CHIP C 0.10UF K		C814			CC73GCH1H101J	CHIP C 100PF J	
C632			C92-0694-05	TANTAL 10UF 16WV		C817,818			CK73GB1H103K	CHIP C 0.010UF K	
C633,634			CK73GB1C104K	CHIP C 0.10UF K		C821			C92-0628-05	CHIP-TAN 10UF 10WV	
C635			C92-0694-05	TANTAL 10UF 16WV		C822			CC73GCH1H150J	CHIP C 15PF J	
C636-638			CK73GB1C104K	CHIP C 0.10UF K		C901-904			CK73GB1H103K	CHIP C 0.010UF K	
C639			C92-0694-05	TANTAL 10UF 16WV		C905			CC73GCH1H101J	CHIP C 100PF J	
C640,641			C92-0560-05	CHIP-TAN 10UF 6.3WV		C906			CK73GB1H103K	CHIP C 0.010UF K	
C642			C92-0694-05	TANTAL 10UF 16WV		C907			CC73GCH1H220J	CHIP C 22PF J	
C643			CK73GB1C104K	CHIP C 0.10UF K		C908,909			CK73GB1H103K	CHIP C 0.010UF K	
C644			CK73GB1A105K	CHIP C 1.0UF K		C911			CK73GB1H102K	CHIP C 1000PF K	
C681			C92-0005-05	CHIP-TAN 2.2UF 6.3WV		C913-916			CK73GB1H103K	CHIP C 0.010UF K	
C682			C92-0628-05	CHIP-TAN 10UF 10WV		C923,924			CK73GB1H103K	CHIP C 0.010UF K	
C685			CK73GB1H103K	CHIP C 0.010UF K		C925			CC73GCH1H050B	CHIP C 5.0PF B	
C686			C92-0002-05	CHIP-TAN 0.22UF 35WV		C926			CK73GB1H103K	CHIP C 0.010UF K	
C687			CK73GB1H103K	CHIP C 0.010UF K		C927			CC73GCH1H101J	CHIP C 100PF J	
C688			C92-0004-05	CHIP-TAN 1.0UF 16WV		C928			CC73GCH1H560J	CHIP C 56PF J	
C689			C92-0560-05	CHIP-TAN 10UF 6.3WV		C931-938			CK73GB1H103K	CHIP C 0.010UF K	
C690			C92-0507-05	CHIP-TAN 4.7UF 6.3WV		C943			CC73GCH1H200J	CHIP C 20PF J	
C691			CK73GB1H102K	CHIP C 1000PF K		C944			CK73GB1H103K	CHIP C 0.010UF K	
C692			CK73GB1C104K	CHIP C 0.10UF K		C949-959			CK73GB1H103K	CHIP C 0.010UF K	
C693			CK73GB1H471K	CHIP C 470PF K		C960,961			CC73GCH1H100D	CHIP C 10PF D	
C694			CK73GB1H103K	CHIP C 0.010UF K		C962			CC73GCH1H050B	CHIP C 5.0PF B	
C695			C92-0561-05	CHIP-ELE 22UF 16WV		C972			CK73GB1H103K	CHIP C 0.010UF K	
C696			CK73GB1C104K	CHIP C 0.10UF K		C973			CE04EW1C100M	ELECTRO 10UF 16WV	
C697			CK73GB1C473K	CHIP C 0.047UF K		C974			CK73GB1C473K	CHIP C 0.047UF K	
C698			CK73GB1H102K	CHIP C 1000PF K		C975			CK73GB1H103K	CHIP C 0.010UF K	
C699			CK73GB1A105K	CHIP C 1.0UF K		C977			CC73GCH1H100D	CHIP C 10PF D	
C700			CK73GB1H103K	CHIP C 0.010UF K		C978-980			CK73GB1H103K	CHIP C 0.010UF K	
C701-705			CK73GB1C104K	CHIP C 0.10UF K		C981			CK73GB1C473K	CHIP C 0.047UF K	
C706,707			CK73GB1A105K	CHIP C 1.0UF K		C982,983			CC73GCH1H050B	CHIP C 5.0PF B	
C731,732			CK73GB1H103K	CHIP C 0.010UF K		C984			CK73GB1H103K	CHIP C 0.010UF K	
C733-736			CK73GB1C104K	CHIP C 0.10UF K		C985			CC73GCH1H470J	CHIP C 47PF J	
C737			CK73GB1H103K	CHIP C 0.010UF K		TC1			C05-0384-05	CERAMIC TRIMMER CAP (10PF)	
C738,739			CK73GB1C104K	CHIP C 0.10UF K		TC451-453			C05-0384-05	CERAMIC TRIMMER CAP (10PF)	
C741,742			CK73GB1A105K	CHIP C 1.0UF K		CN1			E04-0191-05	PIN SOCKET	
C744		*	C90-4113-05	ELECTRO 220UF 16WV		CN3			E04-0191-05	PIN SOCKET	
C745,746			CK73GB1A105K	CHIP C 1.0UF K		CN359			E40-5978-05	FLAT CABLE CONNECTOR	
C747			CK73GB1H103K	CHIP C 0.010UF K		CN369			E40-3252-05	PIN ASSY	
C749			CK73GB1H103K	CHIP C 0.010UF K		CN375			E40-5758-05	FLAT CABLE CONNECTOR	
C750,751			CE04EW1C470M	ELECTRO 47UF 16WV		CN382			E40-3247-05	PIN ASSY	
C752		*	C90-4111-05	ELECTRO 470UF 16WV		CN390		*	E40-6357-05	PIN ASSY	
C753			CK73FB1E104K	CHIP C 0.10UF K		CN403			E40-5978-05	FLAT CABLE CONNECTOR	
C754		*	C90-4114-05	ELECTRO 470UF 16WV							

## PARTS LIST

### TX-RX UNIT (X57-663X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
CN501			E04-0191-05	PIN SOCKET		L218-220			L40-1015-34	SMALL FIXED INDUCTOR (100UH)	
CN554		*	E40-6267-05	PIN ASSY		L221			L92-0149-05	FERRITE CHIP	
CN555		*	E40-6273-05	PIN ASSY		L222		*	L41-1005-27	SMALL FIXED INDUCTOR	
CN901		*	E40-6266-05	PIN ASSY		L223			L40-1005-34	SMALL FIXED INDUCTOR (10UH)	
CN971		*	E40-6272-05	PIN ASSY		L226			L40-1015-34	SMALL FIXED INDUCTOR (100UH)	
J131		*	E56-0411-05	DIN SOCKET		L227		*	L41-1005-27	SMALL FIXED INDUCTOR	
J132			E56-0405-05	DIN SOCKET		L228,229			L40-1015-34	SMALL FIXED INDUCTOR (100UH)	
J201			E58-0435-05	SUB SOCKET (D)		L351			L40-1005-34	SMALL FIXED INDUCTOR (10UH)	
J202		*	E58-0506-05	MODULAR JACK		L352-357			L92-0149-05	FERRITE CHIP	
J351		*	E58-0507-05	MODULAR JACK		L358			L40-1005-34	SMALL FIXED INDUCTOR (10UH)	
J731			E11-0414-05	3.5D PHONE JACK (3P)		L361-363			L40-1005-34	SMALL FIXED INDUCTOR (10UH)	
W501		*	E37-1058-05	LEAD WIRE WITH CONNECTOR		L364		*	L41-1015-27	SMALL FIXED INDUCTOR	
-		*	F10-2458-04	SHIELDING CASE		L365,366			L40-1005-34	SMALL FIXED INDUCTOR (10UH)	
-		*	F10-2459-04	SHIELDING CASE		L451,452		*	L41-2295-09	SMALL FIXED INDUCTOR	
-			F20-3320-04	INSULATING SHEET		L453,454			L41-1005-08	SMALL FIXED INDUCTOR	
CF1			L72-0343-05	CERAMIC FILTER		L455		*	L41-2288-09	SMALL FIXED INDUCTOR	
CF551			L72-0372-05	CERAMIC FILTER		L456		*	L41-1888-09	SMALL FIXED INDUCTOR	
L1			L40-1005-34	SMALL FIXED INDUCTOR (10UH)		L457,458			L40-2205-34	SMALL FIXED INDUCTOR (22UH)	
L3			L40-1595-34	SMALL FIXED INDUCTOR (1.5UH)		L461		*	L41-2295-09	SMALL FIXED INDUCTOR	
L4			L40-2295-34	SMALL FIXED INDUCTOR (2.2UH)		L462			L41-1005-08	SMALL FIXED INDUCTOR	
L5			L40-1005-34	SMALL FIXED INDUCTOR (10UH)		L463			L40-1095-34	SMALL FIXED INDUCTOR (1UH)	
L6			L34-4345-05	COIL		L464		*	L41-1588-09	SMALL FIXED INDUCTOR	
L7		*	L39-1480-05	TOROIDAL COIL		L465			L40-2205-34	SMALL FIXED INDUCTOR (22UH)	
L8			L40-1005-34	SMALL FIXED INDUCTOR (10UH)		L466			L40-3975-34	SMALL FIXED INDUCTOR (39NH)	
L9			L34-4345-05	COIL		L501			L40-1085-34	SMALL FIXED INDUCTOR (100NH)	
L10			L40-1015-34	SMALL FIXED INDUCTOR (100UH)		L502			L40-2285-34	SMALL FIXED INDUCTOR (220NH)	
L11			L40-2295-34	SMALL FIXED INDUCTOR (2.2UH)		L503			L33-0695-05	SMALL FIXED INDUCTOR	
L12,13			L40-1005-34	SMALL FIXED INDUCTOR (10UH)		L504			L40-4795-34	SMALL FIXED INDUCTOR (4.7UH)	
L14			L40-1085-34	SMALL FIXED INDUCTOR (100NH)		L505			L40-4705-34	SMALL FIXED INDUCTOR (47UH)	
L15,16			L40-8285-34	SMALL FIXED INDUCTOR (820NH)		L506,507			L34-4401-05	COIL	
L18			L40-4785-34	SMALL FIXED INDUCTOR (470NH)		L551			L34-4459-05	COIL	
L19			L40-5685-34	SMALL FIXED INDUCTOR (560NH)		L552			L40-1085-34	SMALL FIXED INDUCTOR (100NH)	
L20			L40-6885-34	SMALL FIXED INDUCTOR (680NH)		L553,554		*	L34-4710-05	COIL	
L21			L40-2275-34	SMALL FIXED INDUCTOR (22NH)		L556			L40-3305-34	SMALL FIXED INDUCTOR (33UH)	
L22			L40-8285-34	SMALL FIXED INDUCTOR (820NH)		L558			L40-1015-34	SMALL FIXED INDUCTOR (100UH)	
L23		*	L40-8275-34	SMALL FIXED INDUCTOR (82NH)		L622,623			L40-1005-34	SMALL FIXED INDUCTOR (10UH)	
L24			L40-2275-34	SMALL FIXED INDUCTOR (22NH)		L624-626			L40-1015-34	SMALL FIXED INDUCTOR (100UH)	
L25			L40-4785-34	SMALL FIXED INDUCTOR (470NH)		L682			L40-1015-34	SMALL FIXED INDUCTOR (100UH)	
L26		*	L40-8275-34	SMALL FIXED INDUCTOR (82NH)		L801			L40-1015-34	SMALL FIXED INDUCTOR (100UH)	
L27			L40-1005-34	SMALL FIXED INDUCTOR (10UH)		L901,902			L40-1015-34	SMALL FIXED INDUCTOR (100UH)	
L28			L40-1085-34	SMALL FIXED INDUCTOR (100NH)		L903			L40-4795-34	SMALL FIXED INDUCTOR (4.7UH)	
L29			L40-1015-34	SMALL FIXED INDUCTOR (100UH)		L904			L40-1005-34	SMALL FIXED INDUCTOR (10UH)	
L30			L40-3375-34	SMALL FIXED INDUCTOR (33NH)		L905,906			L40-4705-34	SMALL FIXED INDUCTOR (47UH)	
L31			L40-3975-34	SMALL FIXED INDUCTOR (39NH)		L908,909			L40-1015-34	SMALL FIXED INDUCTOR (100UH)	
L33			L40-1005-34	SMALL FIXED INDUCTOR (10UH)		L910			L40-3395-34	SMALL FIXED INDUCTOR (3.3UH)	
L34			L40-1095-34	SMALL FIXED INDUCTOR (1UH)		L931-936			L40-1015-34	SMALL FIXED INDUCTOR (100UH)	
L35			L40-1005-34	SMALL FIXED INDUCTOR (10UH)		L971,972			L40-1015-34	SMALL FIXED INDUCTOR (100UH)	
L132			L40-1005-34	SMALL FIXED INDUCTOR (10UH)		L974,975			L40-4705-34	SMALL FIXED INDUCTOR (47UH)	
L133			L40-1015-34	SMALL FIXED INDUCTOR (100UH)		L976			L40-1001-37	SMALL FIXED INDUCTOR (10UH)	
L134			L40-1095-34	SMALL FIXED INDUCTOR (1UH)		X1		*	L77-1906-05	CRYSTAL RESONATOR (15.6MHZ)	
L171,172			L40-1005-34	SMALL FIXED INDUCTOR (10UH)		X201		*	L77-1907-05	CRYSTAL RESONATOR (22.1184MHZ)	
L174			L92-0149-05	FERRITE CHIP		X202		*	L77-1920-05	CRYSTAL RESONATOR (12.288MHZ)	
L175			L40-1015-34	SMALL FIXED INDUCTOR (100UH)		XF931			L71-0433-15	MCF (10.695MHZ)	
L201			L40-3395-34	SMALL FIXED INDUCTOR (3.3UH)		XF932		*	L71-0604-05	CRYSTAL FILTER (10.695MHZ)	
L202-205			L40-1015-34	SMALL FIXED INDUCTOR (100UH)		CP201			RK75GA1J473J	CHIP-COM 47K J 1/16W	
L207-210			L40-3395-34	SMALL FIXED INDUCTOR (3.3UH)		CP202			RK75GB1J473J	CHIP-COM 47K J 1/16W	
L211			L40-4705-34	SMALL FIXED INDUCTOR (47UH)		CP204			RK75GA1J473J	CHIP-COM 47K J 1/16W	
L212			L40-1015-34	SMALL FIXED INDUCTOR (100UH)		CP205-207			RK75GB1J102J	CHIP-COM 1.0K J 1/16W	
L217		*	L41-1005-27	SMALL FIXED INDUCTOR		CP208			RK75GA1J101J	CHIP-COM 100 J 1/16W	

KH : TS-480HX (K) KS : TS-480SAT (K)  
EH : TS-480HX (E) ES : TS-480SAT (E)

# TS-480HX/480SAT

## PARTS LIST

### TX-RX UNIT (X57-663X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
CP209,210			RK75GB1J101J	CHIP-COM 100 J 1/16W		R46			RK73GB1J470J	CHIP R 47 J 1/16W	
CP211			RK75GA1J101J	CHIP-COM 100 J 1/16W		R47			RK73GB1J271J	CHIP R 270 J 1/16W	
CP212			RK75GB1J102J	CHIP-COM 1.0K J 1/16W		R48,49			RK73GB1J104J	CHIP R 100K J 1/16W	
CP213			RK75GA1J473J	CHIP-COM 47K J 1/16W		R51			RK73GB1J470J	CHIP R 47 J 1/16W	
CP214			RK75GA1J101J	CHIP-COM 100 J 1/16W		R52			RK73GB1J102J	CHIP R 1.0K J 1/16W	
CP215			RK75GB1J101J	CHIP-COM 100 J 1/16W		R53			RK73GB1J101J	CHIP R 100 J 1/16W	
CP216,217			RK75GB1J473J	CHIP-COM 47K J 1/16W		R54			RK73GB1J391J	CHIP R 390 J 1/16W	
CP219			RK75GA1J473J	CHIP-COM 47K J 1/16W		R55			RK73GB1J153J	CHIP R 15K J 1/16W	
CP220-222			RK75GB1J101J	CHIP-COM 100 J 1/16W		R56			RK73GB1J682J	CHIP R 6.8K J 1/16W	
CP223			RK75GA1J101J	CHIP-COM 100 J 1/16W		R57			RK73GB1J331J	CHIP R 330 J 1/16W	
CP224,225			RK75GB1J101J	CHIP-COM 100 J 1/16W		R58,59			RK73GB1J470J	CHIP R 47 J 1/16W	
CP226			RK75GA1J102J	CHIP-COM 1.0K J 1/16W		R60			RK73GB1J271J	CHIP R 270 J 1/16W	
CP228			RK75GB1J473J	CHIP-COM 47K J 1/16W		R61			RK73GB1J470J	CHIP R 47 J 1/16W	
CP230			RK75GA1J473J	CHIP-COM 47K J 1/16W		R63			RK73GB1J271J	CHIP R 270 J 1/16W	
CP231-233			RK75GB1J101J	CHIP-COM 100 J 1/16W		R64			RK73GB1J391J	CHIP R 390 J 1/16W	
CP351			RK75GB1J101J	CHIP-COM 100 J 1/16W		R65			RK73GB1J180J	CHIP R 18 J 1/16W	
CP731,732			RK75GB1J103J	CHIP-COM 10K J 1/16W		R66			RK73GB1J271J	CHIP R 270 J 1/16W	
CP802			RK75GB1J473J	CHIP-COM 47K J 1/16W		R67			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R1			RK73GB1J103J	CHIP R 10K J 1/16W		R68			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R2			RK73GB1J223J	CHIP R 22K J 1/16W		R69,70			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R3			RK73GB1J100J	CHIP R 10 J 1/16W		R71			RK73GB1J122J	CHIP R 1.2K J 1/16W	
R4			RK73GB1J101J	CHIP R 100 J 1/16W		R72			RK73GB1J471J	CHIP R 470 J 1/16W	
R5			RK73GB1J222J	CHIP R 2.2K J 1/16W		R73			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R6			RK73GB1J823J	CHIP R 82K J 1/16W		R74			RK73GB1J471J	CHIP R 470 J 1/16W	
R7			RK73GB1J331J	CHIP R 330 J 1/16W		R75			RK73GB1J153J	CHIP R 15K J 1/16W	
R8			RK73GB1J224J	CHIP R 220K J 1/16W		R76			RK73GB1J682J	CHIP R 6.8K J 1/16W	
R10			RK73GB1J392J	CHIP R 3.9K J 1/16W		R77			RK73GB1J470J	CHIP R 47 J 1/16W	
R11			RK73GB1J100J	CHIP R 10 J 1/16W		R78			RK73GB1J101J	CHIP R 100 J 1/16W	
R12			RK73GB1J101J	CHIP R 100 J 1/16W		R79			RK73GB1J820J	CHIP R 82 J 1/16W	
R13			RK73GB1J822J	CHIP R 8.2K J 1/16W		R80			RK73GB1J103J	CHIP R 10K J 1/16W	
R14			RK73GB1J153J	CHIP R 15K J 1/16W		R81			RK73GB1J271J	CHIP R 270 J 1/16W	
R15			RK73GB1J470J	CHIP R 47 J 1/16W		R82			RK73GB1J180J	CHIP R 18 J 1/16W	
R16			RK73GB1J102J	CHIP R 1.0K J 1/16W		R83			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R17			RK73GB1J391J	CHIP R 390 J 1/16W		R84			RK73GB1J153J	CHIP R 15K J 1/16W	
R18			RK73GB1J100J	CHIP R 10 J 1/16W		R85			RK73GB1J682J	CHIP R 6.8K J 1/16W	
R19			RK73GB1J181J	CHIP R 180 J 1/16W		R86			RK73GB1J271J	CHIP R 270 J 1/16W	
R20			RK73GB1J100J	CHIP R 10 J 1/16W		R87			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R21			RK73GB1J331J	CHIP R 330 J 1/16W		R88			RK73GB1J470J	CHIP R 47 J 1/16W	
R22			RK73GB1J224J	CHIP R 220K J 1/16W		R89			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R23			RK73GB1J823J	CHIP R 82K J 1/16W		R90			R92-1252-05	CHIP R 0 OHM J 1/16W	
R24			RK73GB1J822J	CHIP R 8.2K J 1/16W		R91			RK73GB1J271J	CHIP R 270 J 1/16W	
R25			RK73GB1J153J	CHIP R 15K J 1/16W		R92			RK73GB1J180J	CHIP R 18 J 1/16W	
R26			RK73GB1J470J	CHIP R 47 J 1/16W		R93			RK73GB1J271J	CHIP R 270 J 1/16W	
R27,28			RK73GB1J331J	CHIP R 330 J 1/16W		R94			RK73GB1J103J	CHIP R 10K J 1/16W	
R29			RK73GB1J392J	CHIP R 3.9K J 1/16W		R95			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R30,31			RK73GB1J470J	CHIP R 47 J 1/16W		R96			R92-1252-05	CHIP R 0 OHM J 1/16W	
R32			RK73GB1J103J	CHIP R 10K J 1/16W		R97-102			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R33			RK73GB1J180J	CHIP R 18 J 1/16W		R103,104			R92-1061-05	JUMPER REST 0 OHM	
R34			RK73GB1J470J	CHIP R 47 J 1/16W		R105			RK73GB1J103J	CHIP R 10K J 1/16W	
R35			RK73GB1J180J	CHIP R 18 J 1/16W		R106			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R36			RK73GB1J560J	CHIP R 56 J 1/16W		R107			RK73GB1J103J	CHIP R 10K J 1/16W	
R37			RK73GB1J180J	CHIP R 18 J 1/16W		R108			RK73GB1J560J	CHIP R 56 J 1/16W	
R38			RK73GB1J103J	CHIP R 10K J 1/16W		R109			RK73GB1J104J	CHIP R 100K J 1/16W	
R39			RK73GB1J331J	CHIP R 330 J 1/16W		R110			RK73GB1J560J	CHIP R 56 J 1/16W	
R40			RK73GB1J153J	CHIP R 15K J 1/16W		R131			RK73GB1J221J	CHIP R 220 J 1/16W	
R41			RK73GB1J682J	CHIP R 6.8K J 1/16W		R132			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R42			RK73GB1J104J	CHIP R 100K J 1/16W		R133			RK73GB1J2R2J	CHIP R 2.2 J 1/16W	
R43			RK73GB1J331J	CHIP R 330 J 1/16W		R134			RK73GB1J223J	CHIP R 22K J 1/16W	
R44			RK73GB1J100J	CHIP R 10 J 1/16W		R135			RK73GB1J101J	CHIP R 100 J 1/16W	
R45			R92-1252-05	CHIP R 0 OHM J 1/16W		R136			RK73GB1J123J	CHIP R 12K J 1/16W	

## PARTS LIST

## TX-RX UNIT (X57-663X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Desti-nation	Ref. No.	Address	New parts	Parts No.	Description	Desti-nation
R137			RK73GB1J563J	CHIP R 56K J 1/16W		R286			RK73FB2A102J	CHIP R 1.0K J 1/10W	
R138			RK73GB1J103J	CHIP R 10K J 1/16W		R287			RK73GB1J101J	CHIP R 100 J 1/16W	
R139			RK73GB1J101J	CHIP R 100 J 1/16W		R289			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R140,141			RK73GB1J471J	CHIP R 470 J 1/16W		R290,291			RK73GB1J103J	CHIP R 10K J 1/16W	
R142			RK73GB1J472J	CHIP R 4.7K J 1/16W		R292,293			RK73GB1J222J	CHIP R 2.2K J 1/16W	
R143			RK73GB1J104J	CHIP R 100K J 1/16W		R294			RK73GB1J223J	CHIP R 22K J 1/16W	
R144			RK73GB1J272J	CHIP R 2.7K J 1/16W		R295-297			RK73GB1J103J	CHIP R 10K J 1/16W	
R145			RK73GB1J101J	CHIP R 100 J 1/16W		R298			RK73GB1J334J	CHIP R 330K J 1/16W	
R146,147			RK73GB1J103J	CHIP R 10K J 1/16W		R300			RK73GB1J334J	CHIP R 330K J 1/16W	
R148			RK73GB1J223J	CHIP R 22K J 1/16W		R301,302			R92-1252-05	CHIP R 0 OHM J 1/16W	
R149			RK73GB1J474J	CHIP R 470K J 1/16W		R303			RK73GB1J223J	CHIP R 22K J 1/16W	
R151,152			RK73GB1J153J	CHIP R 15K J 1/16W		R305			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R153			RK73FB2A4R7J	CHIP R 4.7 J 1/10W		R306			RK73GB1J682J	CHIP R 6.8K J 1/16W	
R154,155			RK73GB1J331J	CHIP R 330 J 1/16W		R307			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R201,202			RK73GB1J473J	CHIP R 47K J 1/16W		R308			RK73GB1J101J	CHIP R 100 J 1/16W	
R203			RK73GB1J102J	CHIP R 1.0K J 1/16W		R309			RK73GB1J223J	CHIP R 22K J 1/16W	
R206			RK73GB1J473J	CHIP R 47K J 1/16W		R310			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R209			RK73GB1J153J	CHIP R 15K J 1/16W		R311			RK73GB1J332J	CHIP R 3.3K J 1/16W	
R210			RK73GB1J104J	CHIP R 100K J 1/16W		R312			RK73GB1J474J	CHIP R 470K J 1/16W	
R211			RK73GB1J103J	CHIP R 10K J 1/16W		R313			RK73GB1J473J	CHIP R 47K J 1/16W	
R212			RK73GB1J473J	CHIP R 47K J 1/16W		R314-316			RK73GB1J103J	CHIP R 10K J 1/16W	
R215			RK73GB1J101J	CHIP R 100 J 1/16W		R317			RK73GB1J563J	CHIP R 56K J 1/16W	
R217,218			RK73GB1J102J	CHIP R 1.0K J 1/16W	EH,ES	R318-320			RK73GB1J101J	CHIP R 100 J 1/16W	
R220			RK73GB1J473J	CHIP R 47K J 1/16W		R321			R92-1061-05	JUMPER REST 0 OHM	
R221			RK73GB1J102J	CHIP R 1.0K J 1/16W		R322			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R223			RK73GB1J102J	CHIP R 1.0K J 1/16W	EH,ES	R323			RK73GB1J473J	CHIP R 47K J 1/16W	
R224,225			RK73GB1J473J	CHIP R 47K J 1/16W		R324			RK73GB1J474J	CHIP R 470K J 1/16W	
R227			RK73GB1J101J	CHIP R 100 J 1/16W		R325-327			RK73GB1J473J	CHIP R 47K J 1/16W	
R228			RK73GB1J473J	CHIP R 47K J 1/16W		R328-331			RK73GB1J103J	CHIP R 10K J 1/16W	
R231			RK73GB1J473J	CHIP R 47K J 1/16W		R332,333			RK73GB1J101J	CHIP R 100 J 1/16W	
R234,235			RK73GB1J473J	CHIP R 47K J 1/16W		R334,335			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R236			RK73GB1J153J	CHIP R 15K J 1/16W		R336			RK73GB1J101J	CHIP R 100 J 1/16W	
R237			RK73GB1J103J	CHIP R 10K J 1/16W		R337			RK73GB1J104J	CHIP R 100K J 1/16W	
R239			RK73GB1J102J	CHIP R 1.0K J 1/16W	KS,ES	R338			R92-1252-05	CHIP R 0 OHM J 1/16W	
R240			RK73GB1J473J	CHIP R 47K J 1/16W		R339-344			RK73GB1J101J	CHIP R 100 J 1/16W	
R242			RK73GB1J183J	CHIP R 18K J 1/16W		R351			RK73GJ1J103D	CHIP R 10K D 1/16W	KH,EH
R246			R92-0699-05	CHIP R 10 J 1/2W		R352			RK73GJ1J393D	CHIP R 39K D 1/16W	KH,EH
R247			RK73GB1J822J	CHIP R 8.2K J 1/16W		R353			RK73GJ1J103D	CHIP R 10K D 1/16W	
R248			RK73GB1J562J	CHIP R 5.6K J 1/16W		R354			RK73GJ1J393D	CHIP R 39K D 1/16W	
R251			RK73GB1J223J	CHIP R 22K J 1/16W		R355-362			RK73GB1J101J	CHIP R 100 J 1/16W	
R252			RK73GB1J103J	CHIP R 10K J 1/16W		R364-366			RK73GB1J470J	CHIP R 47 J 1/16W	
R253			RK73GB1J102J	CHIP R 1.0K J 1/16W		R371,372			RK73GB1J473J	CHIP R 47K J 1/16W	
R254			RK73GB1J103J	CHIP R 10K J 1/16W		R373			RK73GJ1J392D	CHIP R 3.9K D 1/16W	KH,EH
R255			RK73GB1J223J	CHIP R 22K J 1/16W		R374			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R256			RK73GB1J473J	CHIP R 47K J 1/16W		R375,376			RK73GB1J101J	CHIP R 100 J 1/16W	
R258			RK73GB1J822J	CHIP R 8.2K J 1/16W		R451,452			RK73GB1J101J	CHIP R 100 J 1/16W	
R259			RK73GB1J562J	CHIP R 5.6K J 1/16W		R453,454			RK73GB1J221J	CHIP R 220 J 1/16W	
R260			R92-1252-05	CHIP R 0 OHM J 1/16W		R455,456			RK73GB1J391J	CHIP R 390 J 1/16W	
R261			RK73GB1J183J	CHIP R 18K J 1/16W		R457-459			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R262			RK73GB1J223J	CHIP R 22K J 1/16W		R460			RK73GB1J101J	CHIP R 100 J 1/16W	
R264-267			RK73GB1J223J	CHIP R 22K J 1/16W		R461			RK73GB1J470J	CHIP R 47 J 1/16W	
R269-272			RK73GB1J103J	CHIP R 10K J 1/16W		R462			RK73GB1J153J	CHIP R 15K J 1/16W	
R273			RK73GB1J223J	CHIP R 22K J 1/16W		R463			RK73GB1J682J	CHIP R 6.8K J 1/16W	
R274			RK73GB1J101J	CHIP R 100 J 1/16W		R464			RK73GB1J221J	CHIP R 220 J 1/16W	
R275-277			RK73GB1J223J	CHIP R 22K J 1/16W		R465			RK73GB1J101J	CHIP R 100 J 1/16W	
R278,279			RK73GB1J101J	CHIP R 100 J 1/16W		R466			RK73GB1J391J	CHIP R 390 J 1/16W	
R280			RK73GB1J223J	CHIP R 22K J 1/16W		R468			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R281,282			RK73GB1J101J	CHIP R 100 J 1/16W		R469-471			R92-0670-05	CHIP R 0 OHM	
R283,284			RK73GB1J104J	CHIP R 100K J 1/16W		R501			RK73GB1J101J	CHIP R 100 J 1/16W	
R285			RK73GB1J101J	CHIP R 100 J 1/16W		R502			RK73GB1J104J	CHIP R 100K J 1/16W	

KH : TS-480HX (K)    KS : TS-480SAT (K)  
EH : TS-480HX (E)    ES : TS-480SAT (E)



# TS-480HX/480SAT

## PARTS LIST

### TX-RX UNIT (X57-663X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
R503,504			RK73GB1J101J	CHIP R 100 J 1/16W		R593			R92-1252-05	CHIP R 0 OHM J 1/16W	
R505			RK73GB1J102J	CHIP R 1.0K J 1/16W		R594			RK73GB1J470J	CHIP R 47 J 1/16W	
R506			RK73GB1J221J	CHIP R 220 J 1/16W		R595,596			RK73GB1J474J	CHIP R 470K J 1/16W	
R507			RK73GB1J102J	CHIP R 1.0K J 1/16W		R597			RK73GB1J222J	CHIP R 2.2K J 1/16W	
R508			RK73GB1J223J	CHIP R 22K J 1/16W		R598			RK73GB1J331J	CHIP R 330 J 1/16W	
R509			RK73GB1J103J	CHIP R 10K J 1/16W		R599			RK73GB1J101J	CHIP R 100 J 1/16W	
R510			RK73GB1J101J	CHIP R 100 J 1/16W		R600,601			RK73GB1J471J	CHIP R 470 J 1/16W	
R511			RK73GB1J473J	CHIP R 47K J 1/16W		R602			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R512			RK73GB1J683J	CHIP R 68K J 1/16W		R603			RK73GB1J681J	CHIP R 680 J 1/16W	
R513			RK73GB1J103J	CHIP R 10K J 1/16W		R604			RK73GB1J221J	CHIP R 220 J 1/16W	
R514			RK73GB1J223J	CHIP R 22K J 1/16W		R605			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R515			RK73GB1J102J	CHIP R 1.0K J 1/16W		R606			RK73GB1J331J	CHIP R 330 J 1/16W	
R516			RK73GB1J103J	CHIP R 10K J 1/16W		R607			RK73GB1J821J	CHIP R 820 J 1/16W	
R517			RK73GB1J152J	CHIP R 1.5K J 1/16W		R608			RK73GB1J103J	CHIP R 10K J 1/16W	
R518			RK73GB1J223J	CHIP R 22K J 1/16W		R609			RK73GB1J473J	CHIP R 47K J 1/16W	
R519			RK73GB1J333J	CHIP R 33K J 1/16W		R610			RK73GB1J104J	CHIP R 100K J 1/16W	
R520			RK73GB1J221J	CHIP R 220 J 1/16W		R611			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R521			RK73GB1J102J	CHIP R 1.0K J 1/16W		R612			RK73GB1J104J	CHIP R 100K J 1/16W	
R522			RK73GB1J563J	CHIP R 56K J 1/16W		R622			RK73GB1J101J	CHIP R 100 J 1/16W	
R523			RK73GB1J101J	CHIP R 100 J 1/16W		R624			RK73GB1J471J	CHIP R 470 J 1/16W	
R524			RK73GB1J681J	CHIP R 680 J 1/16W		R625			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R525			RK73GB1J103J	CHIP R 10K J 1/16W		R626			RK73GB1J152J	CHIP R 1.5K J 1/16W	
R526			RK73GB1J154J	CHIP R 150K J 1/16W		R627			RK73GB1J224J	CHIP R 220K J 1/16W	
R527			RK73GB1J101J	CHIP R 100 J 1/16W		R628			RK73GB1J222J	CHIP R 2.2K J 1/16W	
R528			RK73GB1J471J	CHIP R 470 J 1/16W		R629			RK73GB1J334J	CHIP R 330K J 1/16W	
R551			RK73GB1J223J	CHIP R 22K J 1/16W		R631			RK73GB1J561J	CHIP R 560 J 1/16W	
R552			R92-1252-05	CHIP R 0 OHM J 1/16W		R632			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R554			RK73GB1J334J	CHIP R 330K J 1/16W		R633			RK73GB1J331J	CHIP R 330 J 1/16W	
R556			R92-1252-05	CHIP R 0 OHM J 1/16W		R634,635			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R557			RK73GB1J473J	CHIP R 47K J 1/16W		R636			RK73GB1J273J	CHIP R 27K J 1/16W	
R558			RK73GB1J102J	CHIP R 1.0K J 1/16W		R637			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R559			RK73GB1J222J	CHIP R 2.2K J 1/16W		R638			RK73GB1J273J	CHIP R 27K J 1/16W	
R560			RK73GB1J102J	CHIP R 1.0K J 1/16W		R640			R92-1252-05	CHIP R 0 OHM J 1/16W	
R562,563			RK73GB1J332J	CHIP R 3.3K J 1/16W		R641			RK73GB1J331J	CHIP R 330 J 1/16W	
R564			RK73GB1J104J	CHIP R 100K J 1/16W		R642			RK73GB1J471J	CHIP R 470 J 1/16W	
R565			RK73GB1J393J	CHIP R 39K J 1/16W		R643			RK73GB1J332J	CHIP R 3.3K J 1/16W	
R566			RK73GB1J101J	CHIP R 100 J 1/16W		R644			RK73GB1J562J	CHIP R 5.6K J 1/16W	
R567			RK73GB1J331J	CHIP R 330 J 1/16W		R645			RK73GB1J681J	CHIP R 680 J 1/16W	
R568			RK73GB1J103J	CHIP R 10K J 1/16W		R646			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R569			RK73GB1J470J	CHIP R 47 J 1/16W		R647			RK73GB1J473J	CHIP R 47K J 1/16W	
R570			RK73GB1J104J	CHIP R 100K J 1/16W		R648			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R571			RK73GB1J222J	CHIP R 2.2K J 1/16W		R649			RK73GB1J473J	CHIP R 47K J 1/16W	
R572			RK73GB1J102J	CHIP R 1.0K J 1/16W		R650,651			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R573			RK73GB1J101J	CHIP R 100 J 1/16W		R652			RK73GB1J103J	CHIP R 10K J 1/16W	
R574			RK73GB1J104J	CHIP R 100K J 1/16W		R653			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R575			RK73GB1J393J	CHIP R 39K J 1/16W		R654			RK73GB1J103J	CHIP R 10K J 1/16W	
R576			RK73GB1J472J	CHIP R 4.7K J 1/16W		R655			RK73GB1J223J	CHIP R 22K J 1/16W	
R577			RK73GB1J331J	CHIP R 330 J 1/16W		R656			RK73GB1J821J	CHIP R 820 J 1/16W	
R578			RK73GB1J104J	CHIP R 100K J 1/16W		R657			RK73GB1J122J	CHIP R 1.2K J 1/16W	
R579			RK73GB1J103J	CHIP R 10K J 1/16W		R658			RK73GB1J471J	CHIP R 470 J 1/16W	
R580			RK73GB1J470J	CHIP R 47 J 1/16W		R681			RK73GB1J123J	CHIP R 12K J 1/16W	
R583			RK73GB1J101J	CHIP R 100 J 1/16W		R682			R92-1252-05	CHIP R 0 OHM J 1/16W	
R584			RK73GB1J474J	CHIP R 470K J 1/16W		R683			RK73GB1J474J	CHIP R 470K J 1/16W	
R586			RK73GB1J470J	CHIP R 47 J 1/16W		R685			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R587			RK73GB1J222J	CHIP R 2.2K J 1/16W		R686			RK73GB1J274J	CHIP R 270K J 1/16W	
R588			RK73GB1J471J	CHIP R 470 J 1/16W		R687			R92-1252-05	CHIP R 0 OHM J 1/16W	
R589			RK73GB1J562J	CHIP R 5.6K J 1/16W		R688			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R590			RK73GB1J104J	CHIP R 100K J 1/16W		R689			RK73GB1J333J	CHIP R 33K J 1/16W	
R591			RK73GB1J274J	CHIP R 270K J 1/16W		R690			RK73GB1J103J	CHIP R 10K J 1/16W	
R592			RK73GB1J331J	CHIP R 330 J 1/16W		R691			RK73GB1J102J	CHIP R 1.0K J 1/16W	



## PARTS LIST

## TX-RX UNIT (X57-663X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Desti-nation	Ref. No.	Address	New parts	Parts No.	Description	Desti-nation
R692			RK73GB1J153J	CHIP R 15K J 1/16W		R804			RK73GB1J103J	CHIP R 10K J 1/16W	KH,EH
R693-697			RK73GB1J473J	CHIP R 47K J 1/16W		R804			RK73GB1J153J	CHIP R 15K J 1/16W	KS,ES
R698			RK73GB1J103J	CHIP R 10K J 1/16W		R805			RK73GB1J473J	CHIP R 47K J 1/16W	
R699			RK73GB1J102J	CHIP R 1.0K J 1/16W		R806			RK73GB1J103J	CHIP R 10K J 1/16W	
R700			RK73GB1J822J	CHIP R 8.2K J 1/16W		R807			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R701			RK73GB1J330J	CHIP R 33 J 1/16W		R808-811			RK73GB1J333J	CHIP R 33K J 1/16W	KH,EH
R702			RK73GB1J103J	CHIP R 10K J 1/16W		R810,811			RK73GB1J333J	CHIP R 33K J 1/16W	KS,ES
R703			RK73GB1J331J	CHIP R 330 J 1/16W		R812			RK73GB1J104J	CHIP R 100K J 1/16W	
R704			RK73GB1J104J	CHIP R 100K J 1/16W		R813			RK73GB1J334J	CHIP R 330K J 1/16W	
R705			RK73GB1J473J	CHIP R 47K J 1/16W		R814			RK73GB1J333J	CHIP R 33K J 1/16W	
R706			RK73GB1J104J	CHIP R 100K J 1/16W		R815			RK73GB1J222J	CHIP R 2.2K J 1/16W	
R707			RK73GB1J123J	CHIP R 12K J 1/16W		R816			RK73GB1J103J	CHIP R 10K J 1/16W	KH,EH
R708			RK73GB1J683J	CHIP R 68K J 1/16W		R816			RK73GB1J153J	CHIP R 15K J 1/16W	KS,ES
R709,710			RK73GB1J473J	CHIP R 47K J 1/16W		R817			RK73GB1J224J	CHIP R 220K J 1/16W	
R711			RK73GB1J103J	CHIP R 10K J 1/16W		R818			RK73GB1J394J	CHIP R 390K J 1/16W	
R712			RK73GB1J472J	CHIP R 4.7K J 1/16W		R819			RK73GB1J334J	CHIP R 330K J 1/16W	
R713			R92-1252-05	CHIP R 0 OHM J 1/16W		R820			RK73GB1J105J	CHIP R 1.0M J 1/16W	KS,ES
R714			RK73GB1J473J	CHIP R 47K J 1/16W		R820-822			RK73GB1J105J	CHIP R 1.0M J 1/16W	KH,EH
R715			RK73GB1J223J	CHIP R 22K J 1/16W		R822			RK73GB1J105J	CHIP R 1.0M J 1/16W	KS,ES
R731			RK73GB1J101J	CHIP R 100 J 1/16W		R823			R92-1252-05	CHIP R 0 OHM J 1/16W	
R732			RK73GB1J474J	CHIP R 470K J 1/16W		R824			RK73GB1J471J	CHIP R 470 J 1/16W	
R733			RK73GB1J102J	CHIP R 1.0K J 1/16W		R826,827			RK73GB1J471J	CHIP R 470 J 1/16W	KH,EH
R734			R92-1252-05	CHIP R 0 OHM J 1/16W		R827			RK73GB1J471J	CHIP R 470 J 1/16W	KS,ES
R735			RK73GB1J103J	CHIP R 10K J 1/16W		R828			RK73GB1J330J	CHIP R 33 J 1/16W	
R736			RK73GB1J223J	CHIP R 22K J 1/16W		R830			R92-1252-05	CHIP R 0 OHM J 1/16W	
R737			R92-1252-05	CHIP R 0 OHM J 1/16W		R832,833			R92-1252-05	CHIP R 0 OHM J 1/16W	
R738			RK73GB1J473J	CHIP R 47K J 1/16W		R834			RK73GB1J103J	CHIP R 10K J 1/16W	
R739			RK73GB1J103J	CHIP R 10K J 1/16W		R835			RK73GB1J224J	CHIP R 220K J 1/16W	
R740			RK73GB1J104J	CHIP R 100K J 1/16W		R837			RK73GB1J273J	CHIP R 27K J 1/16W	
R741			RK73GB1J393J	CHIP R 39K J 1/16W	KH,EH	R838			RK73GB1J822J	CHIP R 8.2K J 1/16W	
R741			RK73GB1J683J	CHIP R 68K J 1/16W	KS,ES	R839			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R742			RK73GB1J104J	CHIP R 100K J 1/16W		R840			RK73GB1J103J	CHIP R 10K J 1/16W	
R743			RK73GB1J273J	CHIP R 27K J 1/16W		R841			RK73GB1J104J	CHIP R 100K J 1/16W	
R744			RK73GB1J222J	CHIP R 2.2K J 1/16W		R845			RK73GB1J104J	CHIP R 100K J 1/16W	
R745,746			RK73GB1J101J	CHIP R 100 J 1/16W		R846			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R747,748			RK73GB1J104J	CHIP R 100K J 1/16W		R847			RK73GB1J103J	CHIP R 10K J 1/16W	
R749			RK73GB1J564J	CHIP R 560K J 1/16W		R848			RK73GB1J563J	CHIP R 56K J 1/16W	
R750			RK73GB1J104J	CHIP R 100K J 1/16W		R850			RK73GB1J560J	CHIP R 56 J 1/16W	
R751			RK73GB1J473J	CHIP R 47K J 1/16W		R851			R92-1252-05	CHIP R 0 OHM J 1/16W	
R752			RK73GB1J104J	CHIP R 100K J 1/16W		R852			RK73GB1J104J	CHIP R 100K J 1/16W	
R754			RK73GB1J151J	CHIP R 150 J 1/16W		R853			RK73GB1J332J	CHIP R 3.3K J 1/16W	
R756			RK73GB1J103J	CHIP R 10K J 1/16W		R854			R92-1252-05	CHIP R 0 OHM J 1/16W	
R757			RK73GB1J472J	CHIP R 4.7K J 1/16W		R856			R92-1252-05	CHIP R 0 OHM J 1/16W	
R759			RK73GB1J221J	CHIP R 220 J 1/16W		R857			RK73GB1J222J	CHIP R 2.2K J 1/16W	
R760			RK73GB1J104J	CHIP R 100K J 1/16W		R858			RK73GB1J561J	CHIP R 560 J 1/16W	
R762			RK73FB2A4R7J	CHIP R 4.7 J 1/10W		R859			RK73GB1J101J	CHIP R 100 J 1/16W	
R763			RK73GB1J101J	CHIP R 100 J 1/16W		R901			RK73GB1J103J	CHIP R 10K J 1/16W	
R764			RK73GB1J473J	CHIP R 47K J 1/16W		R902,903			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R765			RK73GB1J223J	CHIP R 22K J 1/16W		R904			RK73GB1J223J	CHIP R 22K J 1/16W	
R766,767			RK73GB1J102J	CHIP R 1.0K J 1/16W		R905			RK73GB1J471J	CHIP R 470 J 1/16W	
R768			RK73FB2A4R7J	CHIP R 4.7 J 1/10W		R906			RK73GB1J104J	CHIP R 100K J 1/16W	
R769			RK73GB1J102J	CHIP R 1.0K J 1/16W		R907			RK73GB1J393J	CHIP R 39K J 1/16W	
R770			RK73GB1J473J	CHIP R 47K J 1/16W		R908			RK73GB1J101J	CHIP R 100 J 1/16W	
R772			RK73GB1J224J	CHIP R 220K J 1/16W	KH,EH	R909			RK73GB1J330J	CHIP R 33 J 1/16W	
R772			RK73GB1J394J	CHIP R 390K J 1/16W	KS,ES	R911			RK73GB1J471J	CHIP R 470 J 1/16W	
R774			RK73GB1J182J	CHIP R 1.8K J 1/16W		R912			RK73GB1J470J	CHIP R 47 J 1/16W	
R775			RK73GB1J183J	CHIP R 18K J 1/16W		R913			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R801			R92-1252-05	CHIP R 0 OHM J 1/16W		R914			RK73GB1J331J	CHIP R 330 J 1/16W	
R802			RK73GB1J101J	CHIP R 100 J 1/16W		R918			R92-1252-05	CHIP R 0 OHM J 1/16W	
R803			RK73GB1J333J	CHIP R 33K J 1/16W		R919			RK73GB1J102J	CHIP R 1.0K J 1/16W	

KH : TS-480HX (K) KS : TS-480SAT (K)  
EH : TS-480HX (E) ES : TS-480SAT (E)

# TS-480HX/480SAT

## PARTS LIST

### TX-RX UNIT (X57-663X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination
R920			RK73GB1J222J	CHIP R 2.2K J 1/16W	
R921			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R922			RK73GB1J222J	CHIP R 2.2K J 1/16W	
R923			RK73GB1J103J	CHIP R 10K J 1/16W	
R924			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R925			RK73GB1J822J	CHIP R 8.2K J 1/16W	
R926			RK73GB1J101J	CHIP R 100 J 1/16W	
R927			RK73GB1J562J	CHIP R 5.6K J 1/16W	
R931,932			RK73GB1J152J	CHIP R 1.5K J 1/16W	
R933,934			RK73GB1J392J	CHIP R 3.9K J 1/16W	
R935			RK73GB1J101J	CHIP R 100 J 1/16W	
R936			RK73GB1J331J	CHIP R 330 J 1/16W	
R937-939			RK73GB1J101J	CHIP R 100 J 1/16W	
R940			RK73GB1J391J	CHIP R 390 J 1/16W	
R941,942			R92-1252-05	CHIP R 0 OHM J 1/16W	
R943,944			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R945			RK73GB1J392J	CHIP R 3.9K J 1/16W	
R946			RK73GB1J101J	CHIP R 100 J 1/16W	
R947			RK73GB1J391J	CHIP R 390 J 1/16W	
R948,949			R92-1252-05	CHIP R 0 OHM J 1/16W	
R950			RK73GB1J681J	CHIP R 680 J 1/16W	
R951-954			RK73GB1J152J	CHIP R 1.5K J 1/16W	
R955-958			RK73GB1J101J	CHIP R 100 J 1/16W	
R971			R92-1252-05	CHIP R 0 OHM J 1/16W	
R972			RK73GB1J471J	CHIP R 470 J 1/16W	
R973			RK73GB1J823J	CHIP R 82K J 1/16W	
R975,976			RK73GB1J101J	CHIP R 100 J 1/16W	
R977			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R978			R92-1252-05	CHIP R 0 OHM J 1/16W	
R979			RK73GB1J101J	CHIP R 100 J 1/16W	
R980			RK73GB1J103J	CHIP R 10K J 1/16W	
R981			RK73GB1J471J	CHIP R 470 J 1/16W	
R982			RK73GB1J332J	CHIP R 3.3K J 1/16W	
VR1,2			R12-7484-05	TRIMMING POT. (4.7K/8)	KH,EH
VR2			R12-7484-05	TRIMMING POT. (4.7K/8)	KS,ES
VR621,622			R12-7484-05	TRIMMING POT. (4.7K/8)	
K131			S51-1420-05	RELAY	
K731			S51-1428-05	RELAY	
S201			S62-0412-05	SLIDE SWITCH	
D1			KV1470	VARIABLE CAPACITANCE DIODE	
D2,3			HSC277	DIODE	
D4			MA2S111	DIODE	
D131-135			DA221	DIODE	
D136			MA2S111	DIODE	
D137		*	015AZ3.3-X	ZENER DIODE	
D138			MA2S111	DIODE	
D139		*	015AZ5.1-Y	ZENER DIODE	
D202			MINISMDC050-02	VARISTOR	
D203,204			015AZ6.8	ZENER DIODE	
D205			MA2S111	DIODE	
D206		*	015AZ10-Y	ZENER DIODE	
D207		*	015AZ3.3-X	ZENER DIODE	
D208		*	KDS121E	DIODE	
D210			MA2S111	DIODE	
D211		*	015AZ3.3-X	ZENER DIODE	
D212		*	KDZ18EV	ZENER DIODE	
D213			RLS245	DIODE	
D351,352		*	KDZ18EV	ZENER DIODE	KH,EH
D352		*	KDZ18EV	ZENER DIODE	KS,ES
Ref. No.	Address	New parts	Parts No.	Description	Destination
D353,354			DA221	DIODE	
D355,356			1SS388	DIODE	
D357			MINISMDC050-02	VARISTOR	
D358			RLS245	DIODE	
D359			1SS388	DIODE	
D360			MINISMDC050-02	VARISTOR	
D451,452			KV1470	VARIABLE CAPACITANCE DIODE	
D453,454			HSC277	DIODE	
D455			KV1470	VARIABLE CAPACITANCE DIODE	
D456			HSC277	DIODE	
D501			RB706F-40	DIODE	
D551			RN731V	DIODE	
D552			HSM88AS	DIODE	
D555			HSM88AS	DIODE	
D557,558		*	KDS121E	DIODE	
D559			1SS388	DIODE	
D622,623			MA2S111	DIODE	
D624,625			1SS388	DIODE	
D681-683			MA2S111	DIODE	
D733,734			1SS388	DIODE	
D735		*	KDS121E	DIODE	
D736			MA2S111	DIODE	
D801		*	015AZ5.1-Y	ZENER DIODE	
D802			MA2S111	DIODE	
D804			015AZ6.8	ZENER DIODE	
D805			1SS388	DIODE	KS,ES
D805,806			MA2S111	DIODE	KH,EH
D806			MA2S111	DIODE	KS,ES
D807,808		*	KDS120E	DIODE	
D809		*	015AZ3.3-X	ZENER DIODE	
D810		*	015AZ5.1-Y	ZENER DIODE	
D811			MA2S111	DIODE	
D812,813			1SS388	DIODE	
D816-819			MA2S111	DIODE	
D901-904			RN731V	DIODE	
D905			1SS388	DIODE	
D906			RN731V	DIODE	
D931			RN731V	DIODE	
D932-936		*	1SV312	DIODE	
D937			HSC277	DIODE	
D938			HVC131	DIODE	
D939-941			HSC277	DIODE	
D944,945			1SS388	DIODE	
IC1,2			AD9835BRU	MOS IC	
IC3			LMX2306TMX	MOS IC	
IC201			TC74HC4052AFT	MOS IC	
IC202			AT25640N10SI27	ROM IC	
IC203			ADM202EARU	MOS IC	
IC204		*	HD64F2338VFC25	MCU	
IC205		*	HD74HCT541T	MOS IC	
IC207		*	HD74LV2G34AUS	MOS IC	
IC208			TC7WT125FU	MOS IC	
IC209		*	HD74LV2G34AUS	MOS IC	
IC210,211			PST9130NR	MOS IC	
IC212			M62364FP	MOS IC	
IC213		*	XC6203P332P	MOS IC	
IC214			NJM2100V	MOS IC	
IC215		*	XC6203P332P	MOS IC	
IC216			XC62FP1802P	MOS IC	
IC217			AK4550VT	MOS IC	

# TS-480HX/480SAT

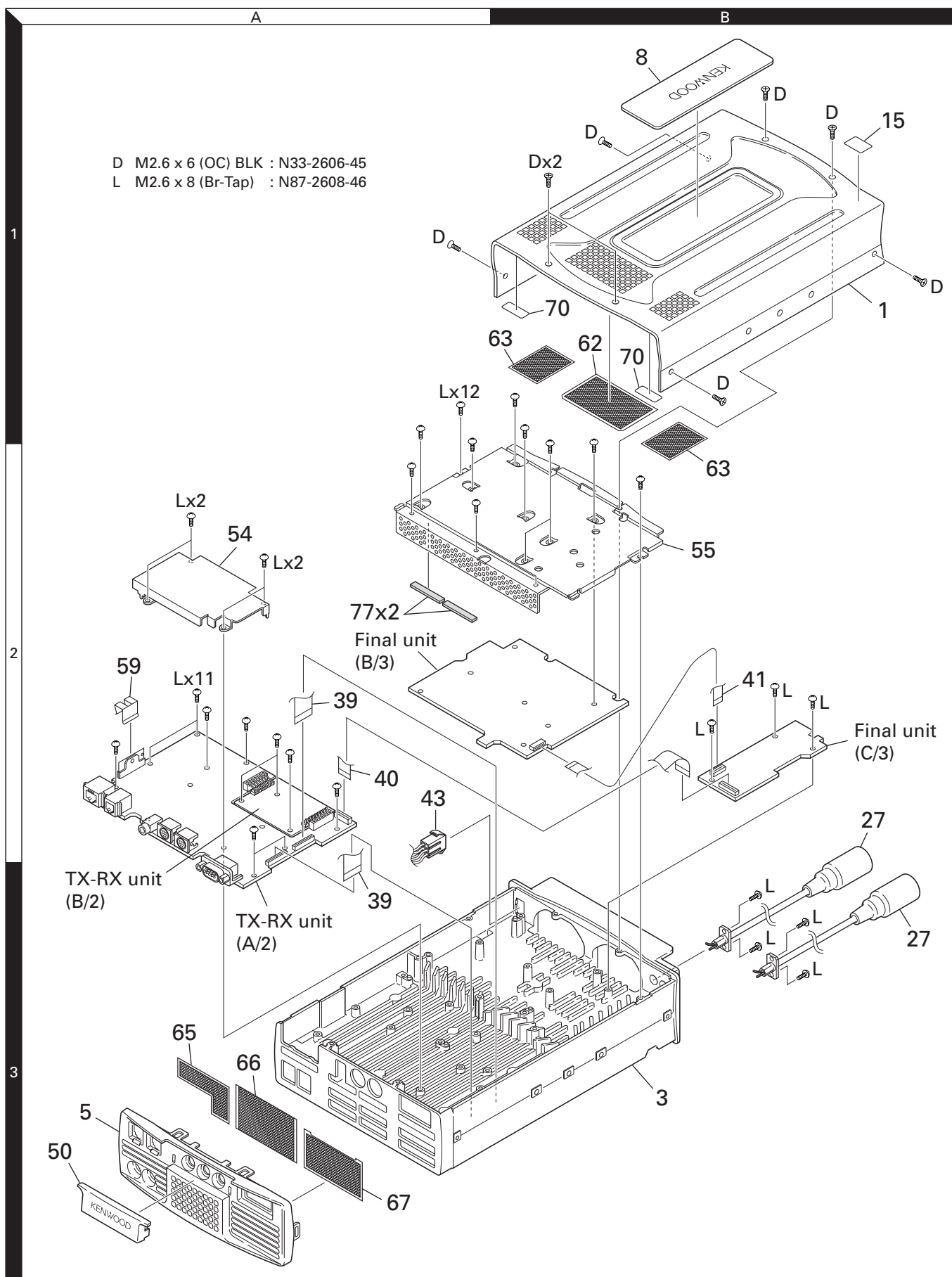
## PARTS LIST

TX-RX UNIT (X57-663X-XX)  
SUB UNIT (X58-4900-XX)

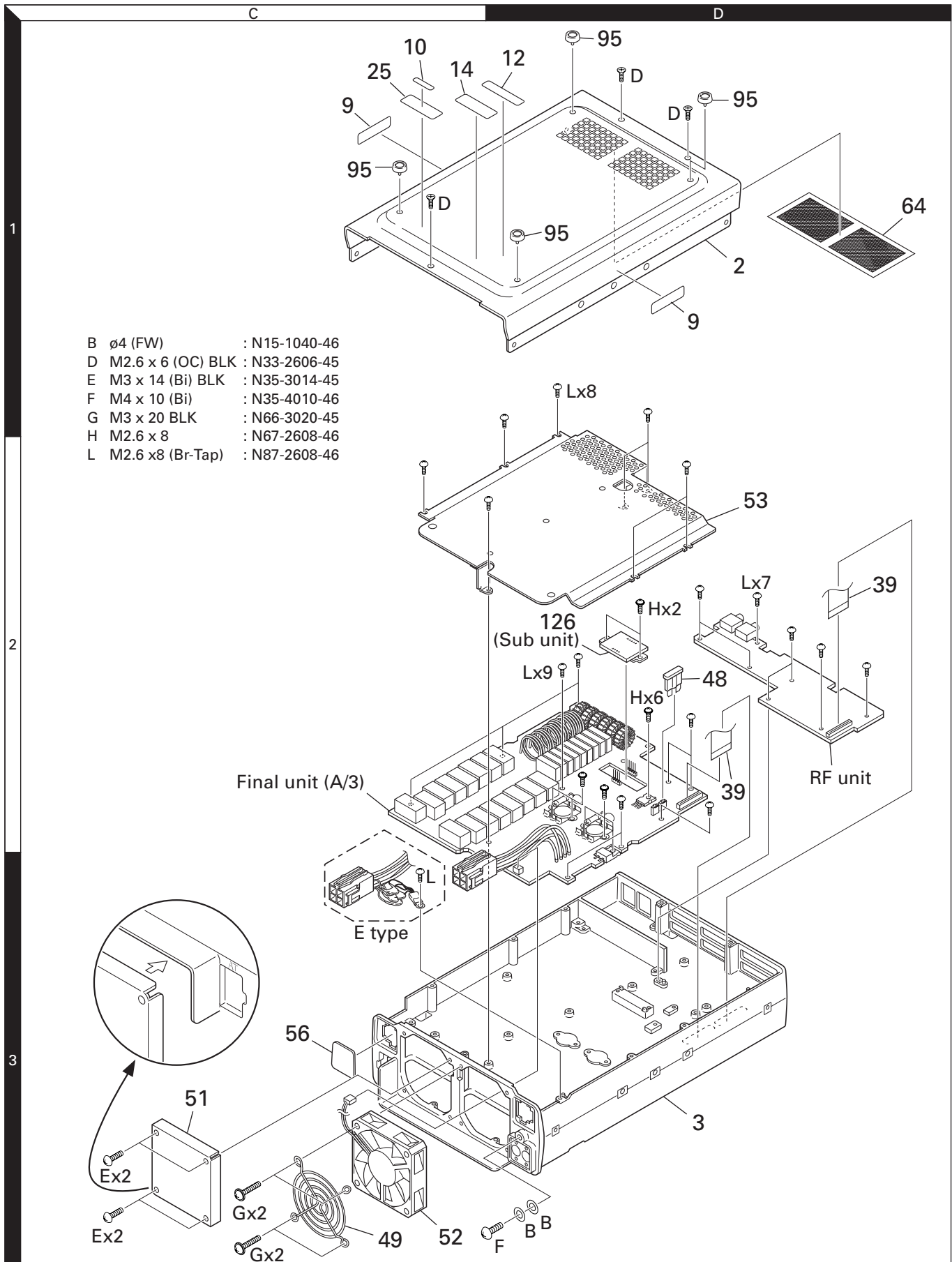
Ref. No.	Address	New parts	Parts No.	Description	Destination	Ref. No.	Address	New parts	Parts No.	Description	Destination
IC218			NJM2100V	MOS IC		Q552			2SC4617(R)	TRANSISTOR	
IC219			BU4066BCFV	MOS IC		Q553			KRC402E	DIGITAL TRANSISTOR	
IC220			320VC5402PGE	MPU		Q554		*	3SK317	FET	
IC221			NJM2100V	MOS IC		Q556-558			2SC4617(R)	TRANSISTOR	
IC222		*	HD74LV541AT	MOS IC		Q559			KRC402E	DIGITAL TRANSISTOR	
IC223			TC7S04FU	MOS IC		Q560			RN1704	TRANSISTOR	
IC224			NJM2100V	MOS IC		Q561			KRC402E	DIGITAL TRANSISTOR	
IC225			TC7WT125FU	MOS IC		Q562		*	KRC404E	DIGITAL TRANSISTOR	
IC226		*	HD74LV1GT125A	MOS IC		Q563			KRC402E	DIGITAL TRANSISTOR	
IC227		*	HD74LV2G34AUS	MOS IC		Q621-623			2SC4617(R)	TRANSISTOR	
IC551			TA31136FN	MOS IC		Q624			2SA1774(R)	TRANSISTOR	
IC552			TC7W66FK	MOS IC		Q625			UMX2N	TRANSISTOR	
IC553			TA4101F	IC (IC)		Q681			RN47A5	TRANSISTOR	
IC554			TC7S51FE	MOS IC		Q682		*	HN7G01FU	TRANSISTOR	
IC621		*	NJM1496V	BI-POLAR IC		Q683			2SC4617(R)	TRANSISTOR	
IC681		*	M62353AGP	MOS IC		Q684		*	HN7G01FU	TRANSISTOR	
IC682			BU4066BCFV	MOS IC		Q685,686			KRC402E	DIGITAL TRANSISTOR	
IC683			NJM2100V	MOS IC		Q731			RN1704	TRANSISTOR	
IC684			BU4S66	MOS IC		Q732,733		*	KRA555U	DIGITAL TRANSISTOR	
IC685			TC7S66FU	MOS IC		Q734			2SK1824	FET	
IC695			XC6204B502MR	MOS IC		Q735			2SD1624(S)	TRANSISTOR	
IC731			BU2099FV	MOS IC		Q737			RN47A5	TRANSISTOR	
IC732			NJM2904V	MOS IC		Q803			RN1701	TRANSISTOR	
IC733			BU4066BCFV	MOS IC		Q805		*	KRC404E	DIGITAL TRANSISTOR	
IC734			LA4446	BI-POLAR IC		Q806			2SC4617(R)	TRANSISTOR	
IC801			NJM2904V	MOS IC		Q807		*	KRA318E	DIGITAL TRANSISTOR	
IC802			NJM2902V	MOS IC		Q901		*	3SK317	FET	
Q1-8			2SC4617(R)	TRANSISTOR		Q902,903			KRC402E	DIGITAL TRANSISTOR	
Q9			UMX2N	TRANSISTOR		Q971			2SC3356	TRANSISTOR	
Q10-12			2SC4617(R)	TRANSISTOR		TH551			157-502-65001	THERMISTOR	
Q13			RN47A5	TRANSISTOR		TH552			157-503-65001	THERMISTOR	
Q14,15			2SC4649(N,P)	TRANSISTOR		TH621,622			157-471-65001	THERMISTOR	
Q16		*	KRC418E	DIGITAL TRANSISTOR		TH901			157-101-65001	THERMISTOR	
Q17			2SC4617(R)	TRANSISTOR		TH902			157-302-65801	THERMISTOR	
Q18			UMX2N	TRANSISTOR		TH971			157-101-65001	THERMISTOR	
Q19			2SC4617(R)	TRANSISTOR		TH972			157-302-65801	THERMISTOR	
Q131			KRC402E	DIGITAL TRANSISTOR							
Q132			2SB1188(Q,R)	TRANSISTOR							
Q133			UMX2N	TRANSISTOR							
Q134,135			RN1704	TRANSISTOR							
Q136			2SK1824	FET							
Q137,138			KRC402E	DIGITAL TRANSISTOR							
Q201			2SC4617(R)	TRANSISTOR							
Q202			2SB1188(Q,R)	TRANSISTOR							
Q203			RN47A5	TRANSISTOR							
Q204		*	KRC401E	DIGITAL TRANSISTOR							
Q205			KRC402E	DIGITAL TRANSISTOR							
Q207		*	HN7G01FU	TRANSISTOR							
Q451,452			2SK508NV(K52)	FET							
Q453,454		*	KRC418E	DIGITAL TRANSISTOR							
Q455			2SC4649(N,P)	TRANSISTOR							
Q456			2SK508NV(K52)	FET							
Q457		*	KRC418E	DIGITAL TRANSISTOR							
Q501			2SC3356	TRANSISTOR							
Q502			UMX2N	TRANSISTOR							
Q503			2SK1824	FET							
Q504-506			2SC4617(Q)	TRANSISTOR							
Q507			KRA302E	DIGITAL TRANSISTOR							
Q508			2SC4617(R)	TRANSISTOR							
Q551		*	3SK317	FET							
<b>SUB UNIT (X58-4900-XX) -00 : KH,EH -01 : KS,ES</b>											
C1			CK73FB1H102K	CHIP C	1000PF	K					
C2,3			CK73FB1E104K	CHIP C	0.10UF	K					
C4-7			CC73FCH1H220J	CHIP C	22PF	J				KS,ES	
C4,5			CC73FCH1H220J	CHIP C	22PF	J				KH,EH	
C6,7			CC73FCH1H331J	CHIP C	330PF	J				KH,EH	
C8,9			CC73FCH1H331J	CHIP C	330PF	J				KS,ES	
C10			CK73FB1E104K	CHIP C	0.10UF	K					
-		*	F01-1029-04	RADIATION PLATE							
R3,4			RK73FB2A332J	CHIP R	3.3K	J	1/10W				
R5,6		*	R92-3569-05	CHIP R	330	J	1/4W				
R7,8			RK73FB2A1R0J	CHIP R	1.0	J	1/10W				
R9,10			RK73FB2A270J	CHIP R	27	J	1/10W			KS,ES	
R9,10			RK73FB2A560J	CHIP R	56	J	1/10W			KH,EH	
D1,2			1SS388	DIODE							
Q1,2			2SK3075-H	FET							

KH : TS-480HX (K) KS : TS-480SAT (K)  
EH : TS-480HX (E) ES : TS-480SAT (E)

## EXPLODED VIEW (MAIN BODY UPPER SIDE)



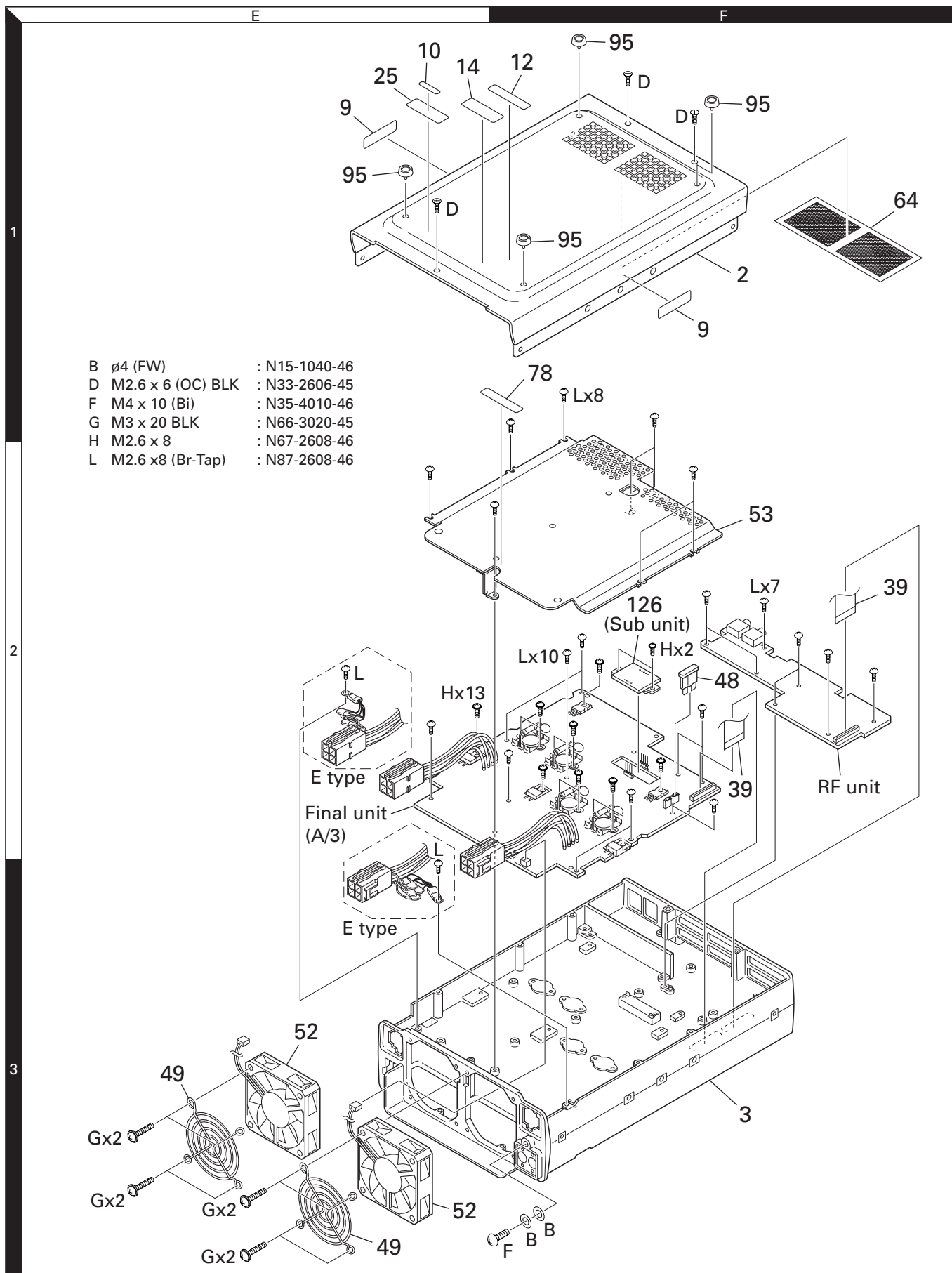
## EXPLODED VIEW (MAIN BODY LOWER SIDE) : TS-480SAT



**Parts with the exploded numbers larger than 700 are not supplied.**

# TS-480HX/480SAT

## EXPLODED VIEW (MAIN BODY LOWER SIDE) : TS-480HX

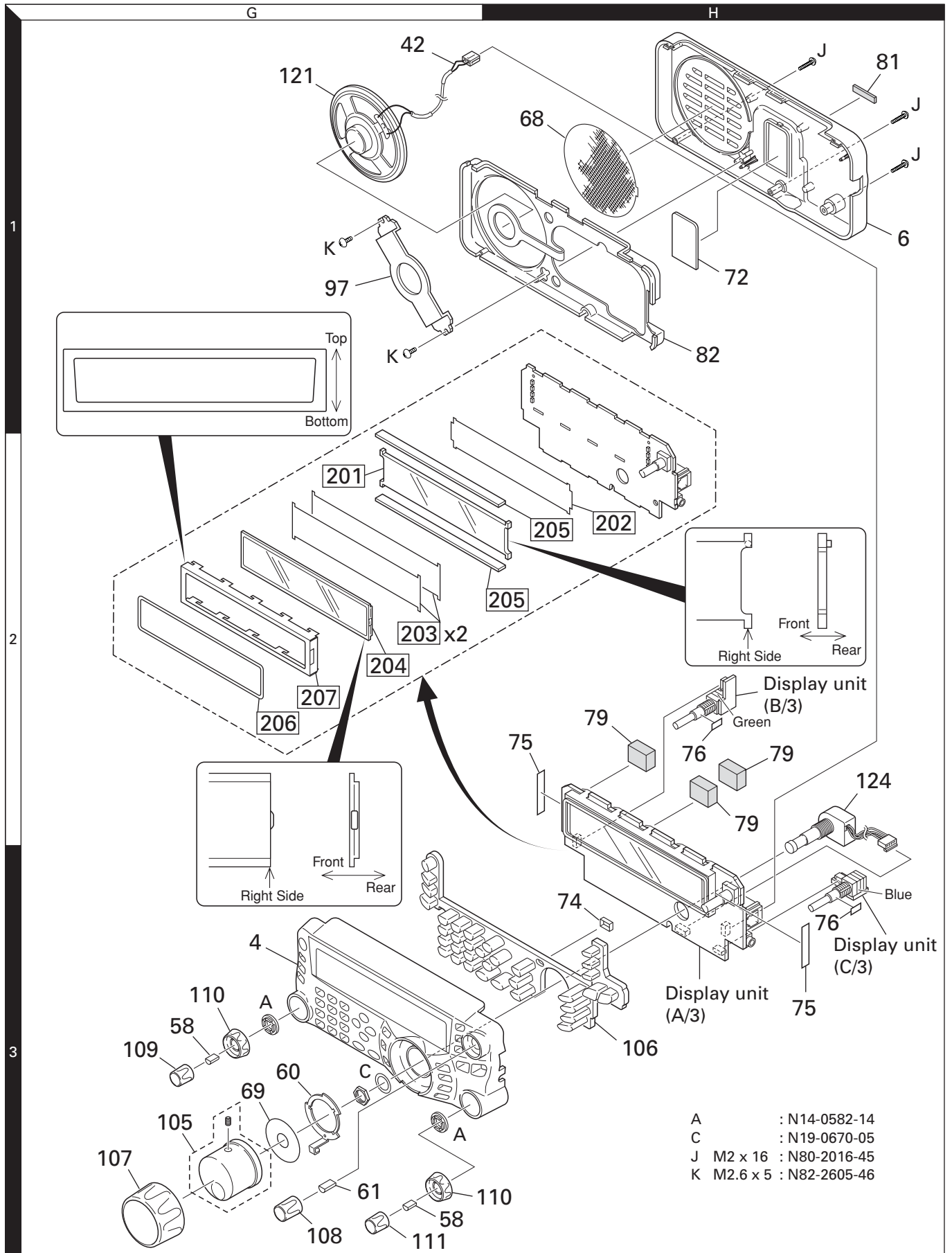


Parts with the exploded numbers larger than 700 are not supplied.



# TS-480HX/480SAT

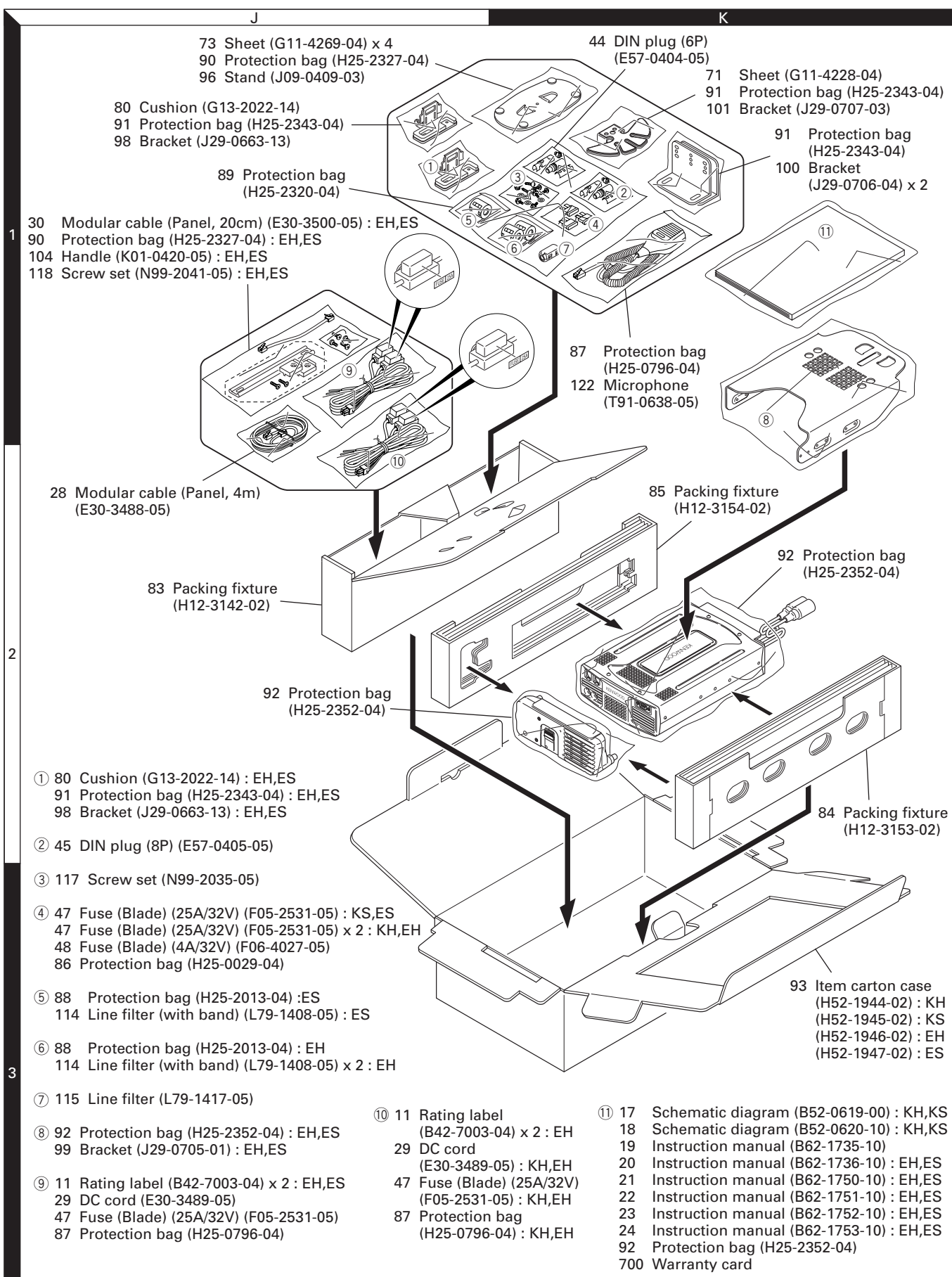
## EXPLODED VIEW (PANEL)



Parts with the exploded numbers larger than 700 are not supplied.



## PACKING



## ADJUSTMENT

### Required Test Equipment

#### 1. DC Voltmeter (DC V.M)

- 1) Input resistance : More than  $1\text{M}\Omega$
- 2) Voltage range : 1.5 to 1000V AC/DC

**Note :** A high-precision multimeter may be used. However, accurate readings can not be obtained for high-impedance circuits.

#### 2. DC Ammeter

- 1) Current range : 100mA, 1.5A, 15A, high-precision ammeter may be used.

#### 3. RF VTVM (RF V.M)

- 1) Input impedance :  $1\text{M}\Omega$  and less than 3pF, min.
- 2) Voltage range : 10mV to 300V
- 3) Frequency range : 10kHz to 500MHz

#### 4. AF Voltmeter (AF V.M)

- 1) Frequency range : 50Hz to 10kHz
- 2) Input resistance :  $1\text{M}\Omega$  or greater
- 3) Voltage range : 10mV to 30V

#### 5. AF Generator (AG)

- 1) Frequency range : 200Hz to 5kHz
- 2) Output : 1mV or less to 1V, low distortion

#### 6. AF Dummy Load (DM. SP)

- 1) Impedance :  $8\Omega$
- 2) Dissipation : 3W or greater

#### 7. Oscilloscope

Requires high sensitivity, and external synchronization capability (150MHz or greater).

#### 8. Standard Signal Generator (SSG)

- 1) Frequency range : 50kHz to 60MHz
  - 2) Output :  $-133\text{dBm}/0.1\mu\text{V}$  to  $7\text{dBm}/1\text{V}$
  - 3) Output impedance :  $50\Omega$
  - 4) AM and FM modulation can be possible
- Note :** Generator must be frequency stable.

#### 9. Frequency Counter (f. counter)

- 1) Minimum input voltage : 50mV
- 2) Frequency range : 150MHz or greater

#### 10. Noise Generator (Noise G.)

Must generate ignition noise containing harmonics beyond 30MHz.

#### 11. Audio Analyzer

#### 12. RF Dummy Load

- 1) Impedance :  $150\Omega$  and  $50\Omega$
- 2) Dissipation : 150W or greater  
250W or greater (TS-480HX)

#### 13. Linear Detector

- 1) Frequency range : 60MHz or greater

#### 14. Power Meter

- 1) Impedance :  $50\Omega$
- 2) Dissipation : 300W continuous or greater
- 3) Frequency limits : 60MHz or greater

#### 15. Spectrum Analyzer

- 1) Frequency range : 100kHz to 140MHz or greater
- 2) Bandwidth : 1kHz to 3MHz

#### 16. Tracking Generator

#### 17. Directional Coupler

#### 18. Monitor Receiver

#### 19. Microphone

MC-43S or MC-60S8 (with MJ-88)

#### 20. Distortion Meter

#### 21. Double Signal Pad ( $50\Omega$ )

# TS-480HX/480SAT

## ADJUSTMENT

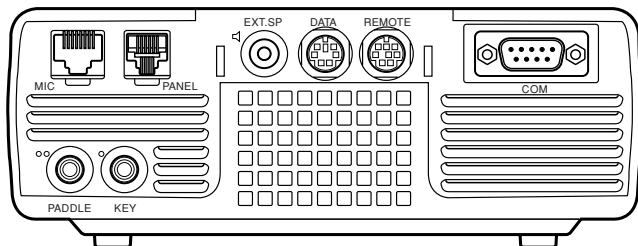
### Preparation

Unless otherwise specified, knobs and switches should be set as follows.

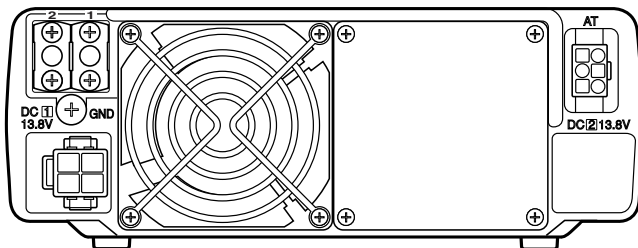
POWER ..... ON  
 IF SHIFT ..... Center  
 AF ..... MIN  
 SQL ..... MIN

### ■ TX/RX unit

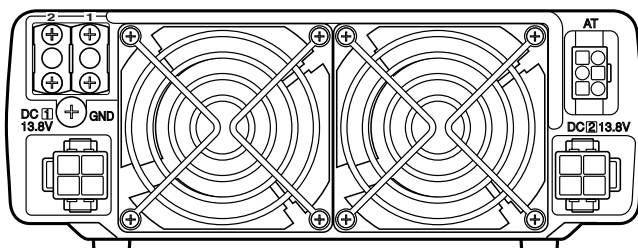
#### • Front panel



#### • Rear panel (TS-480SAT)

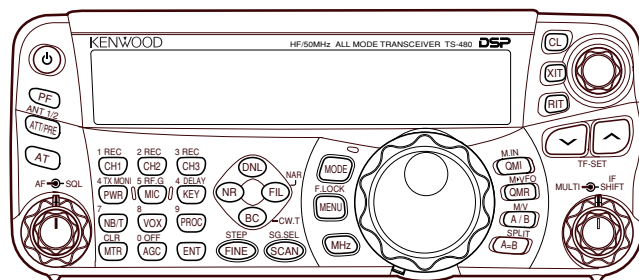


#### • Rear panel (TS-480HX)

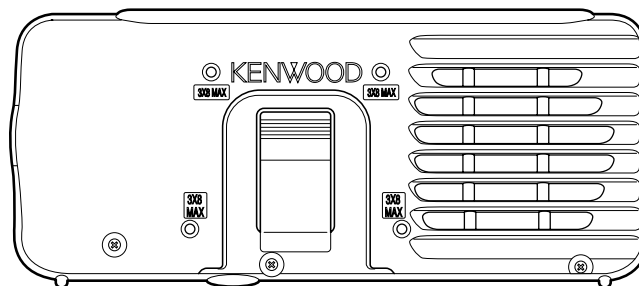


### ■ Remote control panel

#### • Front panel

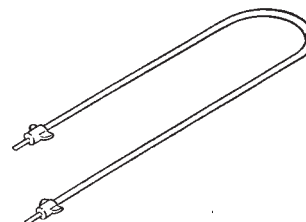


#### • Rear panel

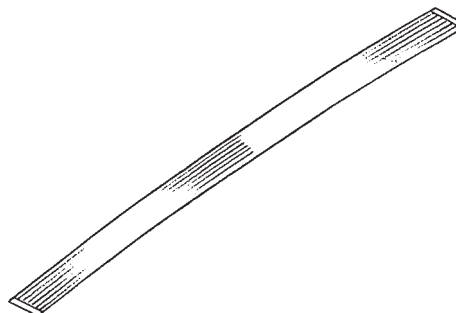


### Service Jig

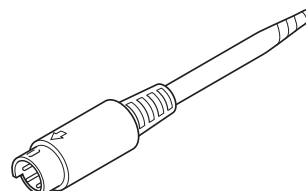
A. Coaxial cable (E37-0620-05), about 37cm



B. Flat cable (12P) (E37-1129-08), about 15cm



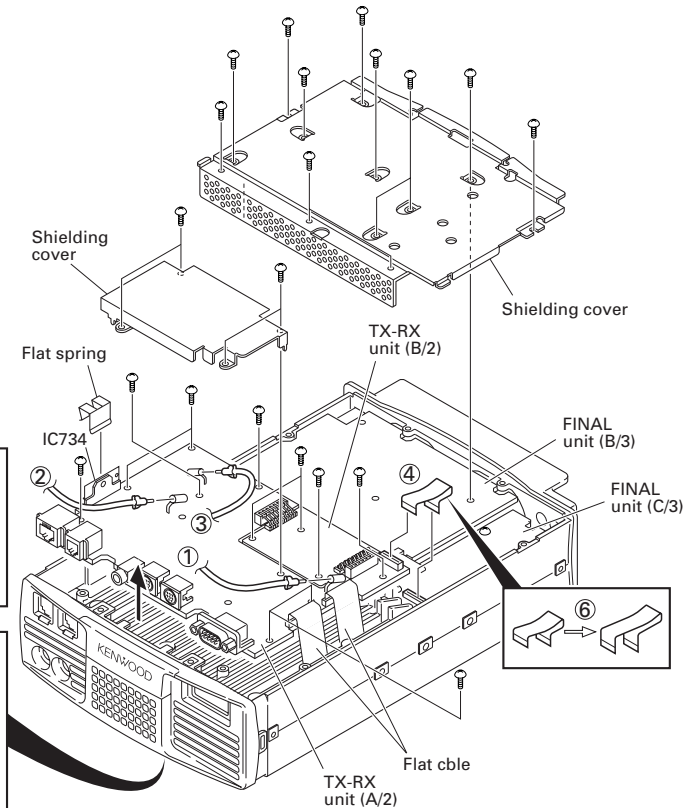
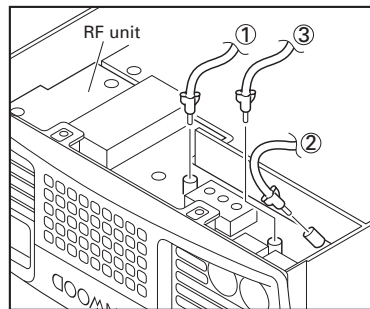
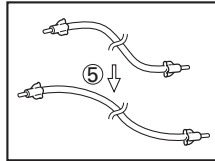
C. Data terminal short plug (W05-0611-00)



## ADJUSTMENT

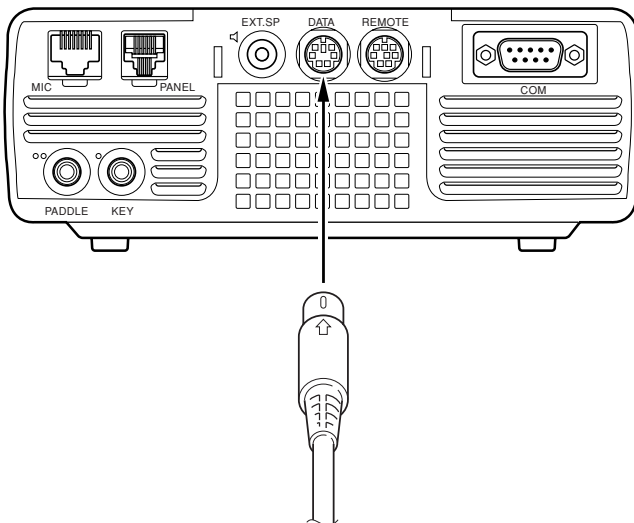
### ■ How to use the coaxial cable and the flat cable

1. Remove the three coaxial cables ( ①, ②, ③ ) from their respective connectors on the TX-RX unit (A/2) and the RF unit.
2. Remove the flat cable ( ④ ) from its connectors on the TX-RX unit (A/2) and the final unit (C/3).
3. Remove the screws from the TX-RX unit (A/2 and B/2) and the final unit (B/3) , then lift the two shield covers from the unit.
4. Remove the flat spring that is attached to the chassis and IC734.
5. Free the TX-RX unit (A/2 and B/2) from the chassis and lift it sideways so as not to damage the two flat cables along the side.
6. Replace the original three coaxial cables with the longer cables ( ⑤ ), then insert them into their respective connectors on the TX-RX unit (A/2) and the RF unit.
7. Exchange the original flat cable with the longer cable ( ⑥ ), then insert it into its connectors on the TX-RX unit (A/2) and the final unit (C/3).

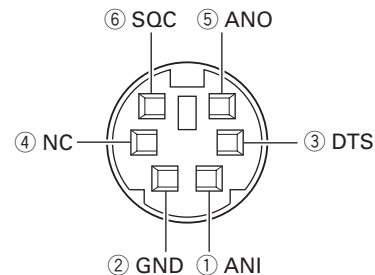


### ■ How to use the data terminal short plug

Insert the adjustment jig (W05-0611-00) into the DATA connector located on the front panel of the transceiver.



### • DATA connector pin assignment



Terminals ③ and ⑥ are short circuited.

③ DTS (SEND switch for DATA terminal)

Connect PTT output. If DTS is set to "GND", data are sent and the microphone will be mute.

⑥ SQC (Squelch control output)

This outputs squelch control output.

## ADJUSTMENT

### Updating the Firmware

#### ■ System requirements

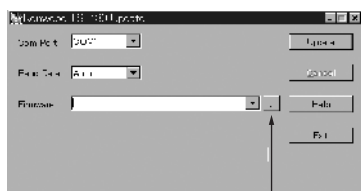
- PC (Windows 95/ 98/ 98SE/ Me/ NT 4.0/ 2000/ XP)
- RS-232C straight cable
- Update software "TS480UPDATE\_S.EXE"

#### ■ Note

1. Execute the full reset to ensure consistency with the backup data after updating the Firmware.
2. When you do not want to remove data such as memory channel data, save the data using the ARCP-480 before updating the Firmware and write the data after updating the Firmware.

#### ■ Operating procedure

1. Disconnect the power cable from the transceiver.
2. Remove the upper case of the transceiver.
3. Set the slide switch (S201) of the TX-RX unit (X57-663 A/2) to ON (move the switch toward the front ).
4. Connect the RS-232C terminal of the PC and the transceiver's COM terminal via a RS-232C straight cable.
5. Connect the power cable with the transceiver. Run the "TS480UPDATE\_S.EXE". The following display appears.

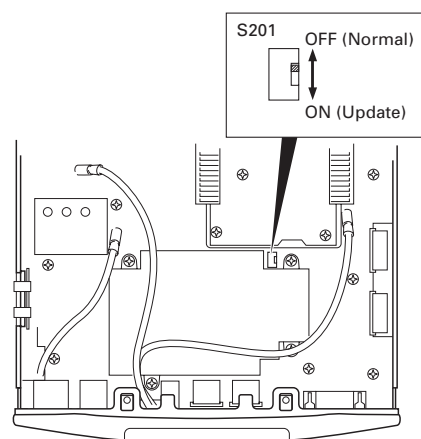


"File reference" button

7. Change the "COM Port" setting if necessary.
8. Change the "Baud Rate" setting if necessary. (Normally, select "Auto", but change it to a slower baud rate if communication errors frequently occur.)
9. Click the "File reference" button and select the firmware to be written (.bin file).
10. Click the [Update] button to start writing. (When an error occurs during updating, disconnect and connect the power cable to reset the MCU. Then, click the [Update] button again.)
11. Disconnect the RS-232C straight cable and the power cable from the transceiver after completing writing.
12. Set the slide switch (S201) of the TX-RX unit (X57-663 A/2) to OFF (move the switch toward the rear ).
13. Replace the upper case, which was removed in step.2, onto the transceiver.
14. Reconnect the power cable, which was disconnected in step.11, to the transceiver.
15. Perform the full reset. (Turn the transceiver ON while pressing the [A=B] key, then press the [A=B] key again when the reset confirmation message appears.)
16. Turn the transceiver OFF.
17. Check the checksum. (Turn the transceiver ON while pressing the [MIC] key and [NR] key, to enter checksum confirmation mode. The checksum of the updated firm-

ware appears on the 7 segment display while the [M-CHKSUM] appears on the 13 segment display.)

18. Turn the transceiver OFF.



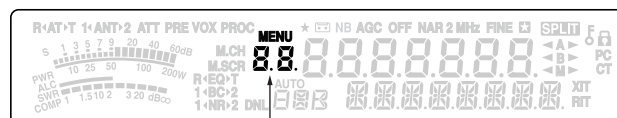
### Adjustment Mode

#### ■ Outline

1. You can adjust the transceiver in service adjustment mode (adjustment using the panel keys) or with manual adjustment (turning a coil and a trimmer, etc).The service adjustment mode (hereinafter referred to as "adjustment mode") has 79 items (Menu No. 00 to 78) and all adjustment data is stored in the EEPROM (X57-663 A/2 : IC202).
2. Enter adjustment mode and change each setting data.
3. New data will be written the EEPROM by performing Menu No. 76 writing.

#### ■ Operation procedures in adjustment mode

1. How to start the adjustment mode
  - Insert the adjustment jig (W05-0611-00) into the DATA connector located on the front panel of the transceiver.
  - Turn the transceiver ON while pressing the [MIC] key and [NR] key, to enter adjustment mode and the Menu No. appears on the Memory Channel No. display. Remove the adjustment jig from the transceiver when the Menu No. appears.



Menu No.

2. Select adjustment mode Menu No.  
Turn the [MULTI] knob to change the Menu No.
3. Change adjustment mode setting data  
Setting data can be changed with [▲] or [▼] key.
4. Write adjustment mode data  
Press [▲] or [▼] key on the main unit or [UP] or [DWN] key on the microphone on Menu No. 76.
5. Cancel adjustment mode  
Press the [MTR] key to return to the normal VFO mode.

**Note:** When the power is turned OFF in the middle in the adjustment mode, it is canceled.

## ADJUSTMENT

## Adjustment Mode Menu (Menu No. 00~78)

No.	Adjustment Item	Apply 100W	Apply 200W	Display	Item	Frequency	Mode
00	IF SHIFT VR	YES	YES	IF.CENTR	Center	14.2M	USB
01	AGC Ref.	YES	YES	AGC REF	Reference	14.2M	USB
02	HF IF Gain	YES	YES	HF. GAIN	AGC Start	14.2M	USB
03	HF SSB S-Meter	YES	YES	HF.SSB S1	SSB S1	14.2M	USB
04		YES	YES	HF.SSB S9	SSB S9		
05		YES	YES	HF.SSB SF	SSB S Full		
06	HF FM S-Meter	YES	YES	HF.FM. S1	FM S1	29.2M	FM
07		YES	YES	HF.FM.SFUL	FM Full		
08	HF FM Squelch	YES	YES	HF.FM.SQ.TH	FM threshold	29.2M	FM
09		YES	YES	HF.FM.SQ.TI	FM tight		
10	50M IF Gain	YES	YES	50. GAIN	AGC Start	50.2M	USB
11	50M SSB S-Meter	YES	YES	50.SSB S1	SSB S1	50.2M	USB
12		YES	YES	50.SSB S9	SSB S9		
13		YES	YES	50.SSB SF	SSB S Full		
14	50M FM S-Meter	YES	YES	50.FM S1	FM S1	50.2M	FM
15		YES	YES	50.FMSFUL	FM Full		
16	50M FM Squelch	YES	YES	50.FM.SQ.TH	FM threshold	50.2M	FM
17		YES	YES	50.FM.SQ.TI	FM tight		
18	ALC Ref.	YES	YES	ALC REF	14.1M	14.1M	USB
19	POC	YES	N/A	POC 100W	100W	14.1M	USB
20		YES	N/A	POC 50W	50W		
21		YES	N/A	POC 25W	25W		
22		YES	N/A	POC 10W	10W		
23		YES	YES	POC 5W	5W		
24	200W POC	N/A	YES	2.POC 200	200W	14.1M	USB
25		N/A	N/A	2.POC 150	N/A	14.1M	
26		N/A	YES	2.POC 100	100W		
27		N/A	YES	2.POC 50	50W		
28		N/A	YES	2.POC 25	25W		
29		N/A	YES	2.POC 10	10W		
30	TGC 1.8M	YES	N/A	TGC 1.8M	100W	1.83M	USB
31	TGC 3.5M	YES	N/A	TGC 3.5M	100W	3.51M	
32	TGC 5M	YES	N/A	TGC 5M	100W	5.3M	
33	TGC 7M	YES	N/A	TGC 7M	100W	7.01M	
34	TGC 10M	YES	N/A	TGC 10M	100W	10.1M	
35	TGC 14M	YES	N/A	TGC 14M	100W	14.1M	
36	TGC 18M	YES	N/A	TGC 18M	100W	18.1M	
37	TGC 21M	YES	N/A	TGC 21M	100W	21.1M	
38	TGC 24.9M	YES	N/A	TGC 24M	100W	24.9M	
39	TGC 28M	YES	N/A	TGC 28M	100W	29.1M	
40	TGC 50M	YES	N/A	TGC 50M	100W	51.9M	
41	TGC 1.8M	N/A	YES	2.TGC 1.8M	200W	1.83M	USB
42	TGC 3.5M	N/A	YES	2.TGC 3.5M	200W	3.51M	
43	TGC 5M	N/A	YES	2.TGC 5M	200W	5.3M	
44	TGC 7M	N/A	YES	2.TGC 7M	200W	7.01M	

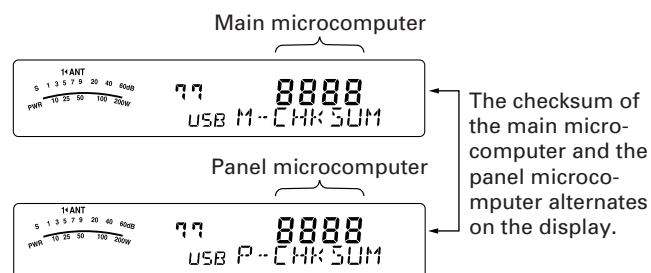


## ADJUSTMENT

No.	Adjustment Item	Apply 100W	Apply 200W	Display	Item	Frequency	Mode
45	TGC 10M	N/A	YES	2.TGC 10M	200W	10.1M	USB
46	TGC 14M	N/A	YES	2.TGC 14M	200W	14.1M	
47	TGC 18M	N/A	YES	2.TGC 18M	200W	18.1M	
48	TGC 21M	N/A	YES	2.TGC 21M	200W	21.1M	
49	TGC 24.9M	N/A	YES	2.TGC 24M	200W	24.9M	
50	TGC 28M	N/A	YES	2.TGC 28M	200W	29.1M	
51	TGC 50M	N/A	YES	2.TGC 50M	100W	51.9M	USB
52	ALC Meter	YES	YES	ALC.START	Start	14.1M	
53		YES	YES	ALC.MAX	Zone Max		
54	CW CAR Level	YES	YES	CAR.LEVEL	Zone Max	14.1M	CW
55	AM CAR Level	YES	YES	CAR.LEVEL	MOD 80% (100W) MOD 75% (200W)	14.1M	AM
56	PGC	YES	N/A	PGC 50W	50W	14.1M	USB
57		YES	N/A	PGC 25W	25W		
58		YES	N/A	PGC 10W	10W		
59		YES	YES	PGC 5W	5W		
60	200W PGC	N/A	YES	2.PGC 100	100W	14.1M	USB
61		N/A	YES	2.PGC 50	50W		
62		N/A	YES	2.PGC 25	25W		
63		N/A	YES	2.PGC 10	10W		
64	FM Modulator	N/A	N/A	MOD.BIAS	Wide	29.1M	FM
65	FM Dev.	YES	YES	DEV.WIDE	Wide	29.1M	FM
66		YES	YES	DEV.NAROW	Narrow		
67	Current Protection	YES	N/A	CURRENT1	DC1:21A	3.51M	USB
68		N/A	YES	CURRENT2	DC1:21A, DC2:21A		
69	CAR Point	YES	YES	CAR.POINT	10.695M	14.1M	USB
70		YES	YES	CAR.POINT	10.695M	14.1M	LSB
71	CAR Suppression	YES	YES	SUPPRESS	USB	14.1M	USB
72		YES	YES	SUPPRESS	LSB	14.1M	LSB
73	SWR Protection	YES	YES	SWR PRO	HF	14.1M	CW
74	SWR Meter	YES	YES	HF SWR	14M	14.1M	CW
75	(SWR : 3)	YES	YES	50M SWR	50M	51.9M	FM
76	EEPROM Write	YES	YES	WRITE ROM			
77	CheckSum	YES	YES	CHECKSUM			
78	Display check	YES	YES				

- You can confirm the settings of Menu No.77 even if you are not in the adjustment mode.
- Turn the transceiver ON while pressing the [MIC] key and [NR] key, to enter checksum confirmation mode.
- The checksum of the main microcomputer and the panel microcomputer alternates on the display.
- The checksum value of the main microcomputer appears on the 7 segment display while [M-CHKSUM] appears on the 13 segment display.
- The checksum value of the panel microcomputer appears on the 7 segment display while [P-CHKSUM] appears on the 13 segment display.

### ■ Menu No. 77 checksum display





## ADJUSTMENT

### Display Check

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Setting and full reset	1) Connect the DC cord to the DC power supply. • TS-480HX DC IN1 and DC IN2 : DC 13.8V • TS-480SAT DC IN1 : DC 13.8V							
	2) Full reset Turn the transceiver ON by pressing the power switch while the [A=B] key is pressed, then press the [A=B] key again when the reset confirmation message appears.				Remote control panel (front)	LCD	After displaying "HELLO", the display is reset as follows; DISP f. : 14.000.00 Mode : USB Meter : ALC ANT : 1 AGC PRE	Display should be normal. Should be at the reset frequency.
2. LCD all segments light	1) Menu No. : 78						Check	LCD all segments light.

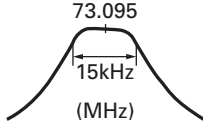
### PLL Section

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. LO2 (62.4MHz) frequency	1) Display f. : 14.200MHz Mode : USB Disconnect the cable from CN1 and insert a cable from the frequency counter. After the adjustment, connect the cable to CN1.	f. counter	TX-RX (A/2)	CN1 (LO2)	TX-RX (A/2)	TC1	62.40000MHz	±30Hz <b>Note</b> : If the SO-3 is installed in the transceiver, do not make the LO2 (62.4MHz) frequency adjustment.
2. LO2 level	1) Display f. : 14.200MHz Mode : USB Disconnect the cable from CN1 and insert a cable from the oscilloscope. After the adjustment, connect the cable to CN1.	Spectrum analyzer				L6 L9	Level max.	-13dBm or more
3. Lock voltage	1) VCO1 Display f. : 15.999MHz Mode : USB Display f. : 30.000kHz	DC V.M		CV	TX-RX (A/2)	TC452	4.20V	±0.05V
							Check	0.2~1.0V
	2) VCO2 Display f. : 35.999MHz Mode : USB Display f. : 16.000MHz				TX-RX (A/2)	TC451	4.20V	±0.05V
							Check	0.2~1.0V
	3) VCO3 Display f. : 59.999MHz Mode : USB Display f. : 36.000MHz				TX-RX (A/2)	TC453	4.05V	±0.05V
							Check	0.2~1.0V

# TS-480HX/480SAT

## ADJUSTMENT

### Receiver Section

Item	Condition	Measurement			Adjustment			Specifications/Remarks	
		Test-equipment	Unit	Terminal	Unit	Parts	Method		
<ul style="list-style-type: none"><li>Perform the following in the adjustment mode. Item 1, 4, 6 and 10~17.</li><li>To terminate the adjustment menu in the middle, save your settings with Menu No. 76.</li></ul>									
1. IF SHIFT VR center voltage	1) Menu No. : 00 (14.2MHz, USB) IF SHIFT knob : Center				Remote control panel (front)	[▲] or [▼]	1 push		
2. MCF (73.095MHz)	1) Display f. : 29.200MHz Mode : FM Spectrum analyzer setting Center f. : 73.095MHz Frequency span : 100kHz XdB/DIV : 10dB RBW : 30kHz VBW : 30kHz	Tracking generator  Spectrum analyzer	RF	TP1 (CN152) TP2 (CN252)	RF	L166 L167 L168	Adjust the coils to obtain the frequency response as shown.		
3. Trap frequency (TS-480HX E type only) • 11.7MHz	1) Display f. : 11.700MHz Mode : AM PRE-AMP : ON AGC : FAST SSG f. : 11.700MHz SSG output : -115dBm (0.398μV) MOD : 1kHz DEV : 60%	SSG  AF V.M	TX/RX unit rear panel  TX/RX unit front panel	ANT1  EXT.SP		TC51	AF output min.		
• 15.5MHz	2) Display f. : 15.500MHz Mode : USB PRE-AMP : ON AGC : FAST SSG f. : 15.501MHz SSG output : -115dBm (0.398μV)					TC52			
4. AGC reference voltage	1) Menu No. : 01 (14.2MHz, USB)	DC V.M	TX-RX (A/2)	AGC	Remote control panel (front)	[▲] or [▼]	Set the adjustment value within the limit of the specified voltage.	2.8V±0.1V	
5. RF IF gain	1) Display f. : 14.200MHz Mode : USB PRE-AMP : ON AGC : FAST AF output : 0.63V/8Ω SSG f. : 14.201MHz SSG output : -115dBm (0.398μV)	SSG  Oscilloscope AF V.M DM.SP	TX/RX unit rear panel  TX/RX unit front panel	ANT1  EXT.SP	TX-RX (A/2)	L553 L554	AF output max.		
6. AGC start level • 14M	1) Menu No. : 02 (14.2MHz, USB) SSG f. : 14.201MHz SSG output : OFF				Remote control panel (front)	[▲] or [▼]	Check the adjustment value (A) displayed on the left side of the display.	<div>02033040</div> <div>A</div>	
	2) SSG output : -109dBm (0.794μV)						Change the adjustment value (B) displayed on the right side of the display by pressing the [▲] or [▼] keys so that adjustment value (A) increase by 3 (A+3).	<div>02036040</div> <div>A+3B</div>	
	• 50M						3) Menu No. : 10 (50.2MHz, USB) SSG f. : 50.201MHz SSG output : OFF	Check the adjustment value (C) displayed on the left side of the display.	<div>10037044</div> <div>C</div>
							4) SSG output : -113dBm (0.501μV)	Change the adjustment value (D) displayed on the right side of the display by pressing the [▲] or [▼] keys so that adjustment value (C) increase by 3 (C+3).	<div>10040044</div> <div>C+3D</div>

## ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
7. FM discriminator	1) Display f. : 29.200MHz Mode : FM AF output : 0.63V/8Ω SSG f. : 29.200MHz SSG output : -53dBm (501μV) MOD : 1kHz DEV : 3kHz	SSG	TX/RX unit rear panel	ANT1	TX-RX (A/2)	L551	AF distortion min.	1.4% or less
8. AF output	1) Display f. : 29.200MHz Mode : FM SSG f. : 29.200MHz SSG output : -53dBm (501μV) MOD : 1kHz DEV : 3kHz AF distortion : 10%	Oscilloscope AF V.M Distortion meter DM.SP Audio analyzer	TX/RX unit front panel	EXT.SP			Check	2.1W or more
9. S/N • 550kHz	1) Display f. : 550kHz Mode : AM PRE-AMP : ON AGC : FAST AF output : 0.63V/8Ω SSG f. : 550kHz SSG output : -79dBm (25μV) MOD : 1kHz DEV : 60%							
	2) DEV : OFF						Check	-10dB or less
• 14.2MHz	3) Display f. : 14.200MHz Mode : USB PRE-AMP : ON AGC : FAST AF output : 0.63V/8Ω SSG f. : 14.201MHz SSG output : -120dBm (0.22μV)							
	4) SSG output : OFF						Check	-10dB or less
• PRE-AMP gain	5) Display f. : 14.200MHz Mode : USB PRE-AMP : ON AGC : FAST AF output : 0.63V/8Ω SSG f. : 14.201MHz SSG output : -114dBm (0.446μV)						Set SINAD at 0dB.	
	6) PRE-AMP : OFF						Check for SINAD	-(5~15)dB
• RF ATT	7) Display f. : 14.200MHz Mode : USB ATT : OFF AGC : FAST AF output : 0.2V/8Ω SSG f. : 14.201MHz SSG output : -107dBm (1μV)						Set AF level at 0dB.	
	8) ATT : ON						Check for AF level	-(9~15)dB
• 28.2MHz	9) Display f. : 28.200MHz Mode : USB PRE-AMP : ON AGC : FAST AF output : 0.63V/8Ω SSG f. : 28.201MHz SSG output : -124dBm (0.141μV)							
	10) SSG output : OFF						Check	-10dB or less

# TS-480HX/480SAT

## ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
• 52.2MHz	11) Display f. : 52.200MHz Mode : FM PRE-AMP : ON AF output : 0.63V/8Ω SSG f. : 52.200MHz SSG output : -119dBm (0.25μV) MOD : 1kHz DEV : 3kHz	SSG	TX/RX unit rear panel	ANT1			Check	12dB SINAD or more
		Oscilloscope AF V.M Distortion meter DM. SP Audio analyzer	TX/RX unit front panel	EXT.SP				
10. HF SSB S-meter • S1	1) Menu No. : 03 (14.2MHz, USB) SSG f. : 14.201MHz SSG output : -107dBm (1μV)				Remote control panel (front)	[▲] or [▼]	1 push	S-meter lights up to S1 level.
• S9	2) Menu No. : 04 (14.2MHz, USB) SSG output : -81dBm (19.9μV)							S-meter lights up to S9 level.
• Full scale (Lights up all)	3) Menu No. : 05 (14.2MHz, USB) SSG output : -21dBm (19.9mV)							S-meter lights up all.
11. HF FM S-meter • S1	1) Menu No. : 06 (29.2MHz, FM) SSG f. : 29.200MHz SSG output : -117dBm (0.316μV) MOD : 1kHz DEV : 3kHz							S-meter lights up to S1 level.
• Full scale (Lights up all)	2) Menu No. : 07 (29.2MHz, FM) SSG output : -95dBm (3.98μV)							S-meter lights up all.
12. 50M SSB S-meter • S1	1) Menu No. : 11 (50.2MHz, USB) SSG f. : 50.201MHz SSG output : -111dBm (0.63μV)							S-meter lights up to S1 level.
• S9	2) Menu No. : 12 (50.2MHz, USB) SSG output : -85dBm (12.6μV)							S-meter lights up to S9 level.
• Full scale (Lights up all)	3) Menu No. : 13 (50.2MHz, USB) SSG output : -25dBm (12.6mV)							S-meter lights up all.
13. 50M FM S-meter • S1	1) Menu No. : 14 (50.2MHz, FM) SSG f. : 50.2MHz SSG output : -117dBm (0.316μV) MOD : 1kHz DEV : 3kHz							S-meter lights up to S1 level.
• Full scale (Lights up all)	2) Menu No. : 15 (50.2MHz, FM) SSG output : -95dBm (3.98μV)							S-meter lights up all.
14. HF FM SQL threshold	1) Menu No. : 08 (29.2MHz, FM) SSG output : OFF MOD : 1kHz DEV : 3kHz							

## ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
15. HF FM SQL thigh	1) Menu No. : 09 (29.2MHz, FM) SSG f. : 29.200MHz SSG output : -113dBm (0.501μV) MOD : 1kHz DEV : 3kHz	SOG	TX/RX unit rear panel	ANT1	Remote control panel (front)	[▲] or [▼]	1 push	
16. 50M FM SQL threshold	1) Menu No. : 16 (50.2MHz, FM) SSG output : OFF MOD : 1kHz DEV : 3kHz	Oscilloscope AF V.M DM. SP	TX/RX unit front panel	EXT.SP				
17. 50M FM SQL tight	1) Menu No. : 17 (50.2MHz, FM) SSG f. : 50.200MHz SSG output : -113dBm (0.501μV) MOD : 1kHz DEV : 3kHz							
<ul style="list-style-type: none"> <li>Writing data : After items 1, 4, 6 and 10~17 have been adjusted;               <ol style="list-style-type: none"> <li>Menu No. : 76</li> <li>[▲] or [▼] key : Push once time. Display "rEAdy" → "good" (If "nG" is displayed, enter data again.)</li> <li>[MTR] key : Push once time.</li> </ol> </li> </ul>								
18. NB gain	1) Display f. : 14.200MHz Mode : USB PRE-AMP : ON AGC : FAST NB : ON SSG f. : 14.201MHz SSG output : -103dBm (1.58μV)	DC V.M  SOG	TX-RX (A/2) TX/RX unit rear panel	NB  ANT1	TX-RX (A/2)	L506 L507	Voltage min.	
	2) NB : OFF→ON	Oscilloscope AF V.M DM.SP	TX/RX unit front panel	EXT.SP			Adjust output of noise generator to S5, and check.	Noise should disappear when NB is on.
19. VGS-1 (Option)	1) Disconnect the antenna cable from the transceiver. Connect the VGS-1 to CN390 on the TX-RX unit (A/2). Display f. : 13.900MHz Mode : USB AF knob : MIN				Remote control panel (front)	[PF]	1 push	The display frequency can be heard vocally.
	2) Connect a microphone to the MIC jack.					[CH1]	Hold down [CH1] key, and talk into the microphone for approximately 5 seconds.	
							Press the [CH1] key again.	The recorded voice message is played back.

# TS-480HX/480SAT

## ADJUSTMENT

### Transmitter Section (TS-480HX)

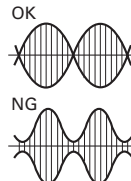
Item	Condition	Measurement			Adjustment			Specifications/Remarks	
		Test-equipment	Unit	Terminal	Unit	Parts	Method		
1. Final idling current	1) Display f. : 14.100MHz Mode : USB Final unit (A/3) VR1, 2, 3, 801 : MIN VR802 : MAX Transmit	Ammeter	TX/RX unit rear panel	DC IN1 DC IN2	Final (A/3)		Check the default current (I <sub>2</sub> ) of DC IN2.	±20mA	
						VR1	I <sub>2</sub> + 300mA = I <sub>A</sub> (at DC IN2)		
						VR2	I <sub>A</sub> + 500mA = I <sub>B</sub> (at DC IN2)		
							Check the default current (I <sub>1</sub> ) of DC IN1.	±20mA	
						VR3	I <sub>1</sub> + 500mA (at DC IN1)		
						VR801	I <sub>B</sub> + 500mA (at DC IN2)		
2. Current protection pre-adjust	1) Display f. : 14.100MHz Mode : USB Transmit	DC V.M	TX-RX (A/2)	VR1 (IP1)	TX-RX (A/2)	VR1	Voltage min.	100mV or less	
				VR2 (IP2)		VR2			
• Perform the following in the adjustment mode. Item 3~18. To terminate the adjustment menu in the middle, save your settings with Menu No. 76.									
3. ALC reference voltage	1) Menu No. : 18 (14.1MHz, USB) Transmit	DC V.M	TX-RX (A/2)	ALC	Remote control panel (front)	[▲] or [▼]	Set the adjustment value wiithin the limit of the specified voltage.	2.6V±0.1V	
4. Drive output level	1) Menu No. : 24 (14.1MHz, USB) Disconnect the cable from CN1 and insert a cable from the spectrum analyzer. Transmit After check, connect the cable to CN1.	Spectrum analyzer	RF	CN1 (DRV)			Check	3dBm or more	
5. Null	1) Menu No. : 26 (14.1MHz, USB) Transmit	Power meter 250W ATT	TX/RX unit rear panel	ANT1	Final (C/3)	TC501	VSR voltage min.	0.3V or less	
		DC V.M	TX-RX (A/2)	VSR					
6. HF power • POC 5W	1) Menu No. : 23 (14.1MHz, USB) Transmit	Power meter 250W ATT	TX/RX unit rear panel	ANT1	Remote control panel (front)	[▲] or [▼]	Set the adjustment value within the limit of the specified power.	5.7W±0.5W	
	• 2POC 10W							2) Menu No. : 29 (14.1MHz, USB) Transmit	12W±0.5W
	• 2POC 25W							3) Menu No. : 28 (14.1MHz, USB) Transmit	27W±1.0W
	• 2POC 50W							4) Menu No. : 27 (14.1MHz, USB) Transmit	53W±2.0W
	• 2POC 100W							5) Menu No. : 26 (14.1MHz, USB) Transmit	105W±5.0W
	• 2POC 200W							6) Menu No. : 24 (14.1MHz, USB) Transmit	205W±5.0W



## ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
7. Band 2TGC (HF) • 1.8M • 3.5M  • 5M  • 7M  • 10M  • 14M  • 18M  • 21M  • 24M  • ODP (Over drive protection)  • 28M	1) Menu No. : 41 (1.83MHz, USB) Transmit	Power meter 250W ATT	TX/RX unit rear panel	ANT1	Remote control panel (front)	[▲] or [▼]	The Band 2TGC adjustment must increase the power from a value smaller than the target transmitting power. To do this, first increase the adjustment value to reduce the transmitting power, then decrease the adjustment value to become within the limits of the target transmitting power.	200W±10W
	2) Menu No. : 42 (3.51MHz, USB) Transmit							
	3) Menu No. : 43 (5.30MHz, USB) Transmit							
	4) Menu No. : 44 (7.01MHz, USB) Transmit							
	5) Menu No. : 45 (10.1MHz, USB) Transmit							
	6) Menu No. : 46 (14.1MHz, USB) Transmit							
	7) Menu No. : 47 (18.1MHz, USB) Transmit							
	8) Menu No. : 48 (21.1MHz, USB) Transmit							
	9) Menu No. : 49 (24.9MHz, USB) Transmit							
	10) Menu No. : 50 (29.1MHz, USB) Transmit						Set the adjustment value within the limit of the specified power.	215W±7.0W
	11) Menu No. : 50 (29.1MHz, USB) Transmit				Final (A/3)	VR802	205W	±2.0W
	12) Menu No. : 50 (29.1MHz, USB) Transmit				Remote control panel (front)	[▲] or [▼]	The Band 2TGC adjustment must increase the power from a value smaller than the target transmitting power. To do this, first increase the adjustment value to reduce the transmitting power, then decrease the adjustment value to become within the limits of the target transmitting power.	200W±10W
8. Power 2PGC • 100W  • 50W  • 25W	1) Menu No. : 60 (14.1MHz, USB) Transmit						Set the adjustment value within the limit of the specified power.	105W±5.0W
	2) Menu No. : 61 (14.1MHz, USB) Transmit							55W±2.0W
	3) Menu No. : 62 (14.1MHz, USB) Transmit							27.5W±1.0W

## ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
<ul style="list-style-type: none"><li>• 10W</li></ul>	4) Menu No. : 63 (14.1MHz, USB) Transmit	Power meter 250W ATT	TX/RX unit rear panel	ANT1	Remote control panel (front)	[▲] or [▼]	Set the adjustment value within the limit of the specified power.	12.5W±0.5W
<ul style="list-style-type: none"><li>• 5W</li></ul>	5) Menu No. : 59 (14.1MHz, USB) Transmit							7.5W±0.5W
9. Band 2TGC (50M)	1) Menu No. : 51 (51.9MHz, USB) Transmit							105W±5.0W
10. ALC meter <ul style="list-style-type: none"><li>• Start point</li></ul>	1) Menu No. : 52 (14.1MHz, USB) Transmit					[▲]	1 push	ALC meter lights up to 1.
<ul style="list-style-type: none"><li>• Zone max.</li></ul>	2) Menu No. : 53 (14.1MHz, USB) Transmit	ALC meter zone max.						
11. FM DEV <ul style="list-style-type: none"><li>• Wide</li></ul>	1) Menu No. : 65 (29.1MHz, FM) Transmit	Power meter Linear detector 250W ATT			[▲] or [▼]	4.3kHz According to the larger +, −.	±0.1kHz	
<ul style="list-style-type: none"><li>• Narrow</li></ul>	2) Menu No. : 66 (29.1MHz, FM) Transmit					2.15kHz According to the larger +, −.		
12. Carrier point <ul style="list-style-type: none"><li>• USB</li></ul>	1) Menu No. : 69 (14.1MHz, USB) Transmit	Oscilloscope 250W ATT				Change the adjust- ment values to get the waveform as shown.		
<ul style="list-style-type: none"><li>• LSB</li></ul>	2) Menu No. : 70 (14.1MHz, LSB) Transmit							
13. AM carrier level	1) Menu No. : 55 (14.1MHz, AM) MIC input AG : OFF Transmit	Power meter 250W ATT Liner detector AG					Check for ALC meter.	1 dot or more
	2) MIC input AG : 1kHz/10mV Transmit				Remote control panel (front)	[▲] or [▼]	Set the adjustment value within the limit of the specified modulation.	75%±5%
14. CW carrier level	1) Menu No. : 54 (14.1MHz, CW) Transmit						Set the adjustment value within the limit of the specified ALC meter.	ALC meter lights up to 6. (ALC meter zone max. + 1 dot)
15. Carrier suppresion <ul style="list-style-type: none"><li>• USB</li></ul>	1) Menu No. : 71 (14.1MHz, USB) Transmit	Spectrum analyzer 250W ATT	TX/RX unit rear panel	ANT1	TX-RX (A/2)	VR621 VR622	Carrier level min.	50dB or more
<ul style="list-style-type: none"><li>• LSB</li></ul>	2) Menu No. : 72 (14.1MHz, LSB) Transmit						Check	

## ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
16. Current protection	1) Menu No. : 68 (3.51MHz, USB) Transmit	Power meter 250W ATT	TX/RX unit rear panel	ANT1	Remote control panel (front)	[▲] or [▼]	Set the adjustment value within the limit of the specified power.	220W±5W
	2) Menu No. : 68 (3.51MHz, USB) Transmit	DC V.M	TX-RX (A/2)	IP3	TX-RX (A/2)	VR1	2.25V	±0.25V
				IP4		VR2		
17. SWR protection	1) Menu No. : 73 (14.1MHz, CW) Transmit	150Ω dummy load Through type power meter 250W ATT	TX/RX unit rear panel	ANT1	Remote control panel (front)	[▲] or [▼]	Set the adjustment value within the limit of the specified power.	80W±2W
18. SWR meter • 14M (SWR : 3)	1) Menu No. : 74 (14.1MHz, CW) Transmit					[▲]	1 push	SWR meter lights up to 3 position.
	• 50M (SWR : 3)					2) Menu No. : 75 (51.9MHz, FM) Transmit		
<div>• Writing data : After items 3~18 have been adjusted; 1) Menu No. : 76 2) [▲] or [▼] key : Push once time. Display “rEAdy” → “good” (If “nG” is displayed, enter data again.) 3) [MTR] key : Push once time.</div>								

## Transmitter Section (TS-480SAT)


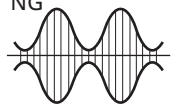
Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Final idling current	1) Display f. : 14.100MHz Mode : USB Final unit (A/3) VR1 : MIN VR2, 3 : Center Transmit	Ammeter	TX/RX unit rear panel	DC IN1	Final (A/3)		Check the default current (I1) of DC IN1.	±20mA
						VR1	I1 + 300mA = I <sub>A</sub>	
						VR2	I <sub>A</sub> + 600mA = I <sub>B</sub>	
						VR3	I <sub>B</sub> + 500mA	
2. Current protection pre-adjust	1) Display f. : 14.100MHz Mode : USB Transmit	DC V.M	TX-RX (A/2)	VR2 (IP2)	TX-RX (A/2)	VR2	Voltage min.	100mV or less
<ul style="list-style-type: none"> <li>Perform the following in the adjustment mode. Item 3~19. To terminate the adjustment menu in the middle, save your settings with Menu No. 76.</li> </ul>								
3. ALC reference voltage	1) Menu No. : 18 (14.1MHz, USB) Transmit	DC V.M	TX-RX (A/2)	ALC	Remote control panel (front)	[▲] or [▼]	Set the adjustment value within the limit of the specified voltage.	2.6V±0.1V

# TS-480HX/480SAT

## ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
4. Drive output level	1) Menu No. : 19 (14.1MHz, USB) Disconnect the cable from CN1 and insert a cable from the spectrum analyzer. Transmit After check, connect the cable to CN1.	Spectrum analyzer	RF	CN1 (DRV)			Check	3dBm or more
5. Null	1) Menu No. : 19 (14.1MHz, USB) Final unit (C/3) VR501 : MAX Transmit	Power meter 150W ATT	TX/RX unit rear panel	ANT1	Final (C/3)	TC501	VSR voltage min.	0.2V or less
		DC V.M	TX-RX (A/2)	VSR				
6. HF power POC • 5W	1) Menu No. : 23 (14.1MHz, USB) Transmit	Power meter 150W ATT	TX/RX unit rear panel	ANT1	Remote control panel (front)	[▲] or [▼]	Set the adjustment value within the limit of the specified power.	5.7W±0.3W
	• 10W							11W±0.5W
	• 25W							26W±1.0W
	• 50W							52W±2.0W
	• 100W							104W±2.0W
							The Band TGC adjustment must increase the power from a value smaller than the target transmitting power. To do this, first increase the adjustment value to reduce the transmitting power, then decrease the adjustment value to become within the limits of the target transmitting power.	100W±5.0W
7. Band TGC (HF) • 1.8M	1) Menu No. : 30 (1.83MHz, USB) Transmit							
	• 3.5M							
	• 5M							
	• 7M							
	• 10M							
	• 14M							

## ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
• 18M	7) Menu No. : 36 (18.1MHz, USB) Transmit	Power meter 150W ATT	TX/RX unit rear panel	ANT1	Remote control panel (front)	[▲] or [▼]	The Band TGC adjustment must increase the power from a value smaller than the target transmitting power. To do this, first increase the adjust- ment value to reduce the transmitting power, then decrease the adjustment value to become within the limits of the target transmitting power.	100W±5.0W
• 21M	8) Menu No. : 37 (21.1MHz, USB) Transmit							
• 24M	9) Menu No. : 38 (24.9MHz, USB) Transmit							
• 28M	10) Menu No. : 39 (29.1MHz, USB) Transmit							
8. Power PGC • 50W	1) Menu No. : 56 (14.1MHz, USB) Transmit						Set the adjustment value within the limit of the specified power.	50W±2.0W
• 25W	2) Menu No. : 57 (14.1MHz, USB) Transmit							25W±1.0W
• 10W	3) Menu No. : 58 (14.1MHz, USB) Transmit							10W±0.5W
• 5W	4) Menu No. : 59 (14.1MHz, USB) Transmit							5W±0.3W
9. Band TGC (50M)	1) Menu No. : 40 (51.9MHz, USB) Transmit							100W±5.0W
10. TX power	1) Menu No. : 75 (51.9MHz, FM) VR501 : Center Transmit				Final (C/3)	VR501	98W	±1W
11. ALC meter • Start point	1) Menu No. : 52 (14.1MHz, USB) Transmit	Power meter Linear detector 150W ATT			Remote control panel (front)	[▲]	1 push	ALC meter lights up to 1.
• Zone max.	2) Menu No. : 53 (14.1MHz, USB) Transmit							ALC meter zone max.
12. FM DEV • Wide	1) Menu No. : 65 (29.1MHz, FM) Transmit					[▲] or [▼]	4.3kHz According to the larger +, -.	±0.1kHz
• Narrow	2) Menu No. : 66 (29.1MHz, FM) Transmit						2.15kHz According to the larger +, -.	
13. Carrier point • USB	1) Menu No. : 69 (14.1MHz, USB) Transmit	Oscilloscope 150W ATT					Change the adjust- ment values to get the waveform as shown.	<div style="text-align: center;">  <p>OK</p>  <p>NG</p> </div>
• LSB	2) Menu No. : 70 (14.1MHz, LSB) Transmit							

# TS-480HX/480SAT

## ADJUSTMENT

Item	Condition	Measurement			Adjustment			Specifications/Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
14. AM carrier level	1) Menu No. : 55 (14.1MHz, AM) MIC input AG : OFF Transmit	Power meter 150W ATT Liner detector AG	TX/RX unit rear panel	ANT1			Check for ALC meter.	1 dot or more
	2) MIC input AG : 1kHz/10mV Transmit				Remote control panel (front)	[▲] or [▼]	Set the adjustment value within the limit of the specified modulation.	80%±5%
15. CW carrier level	1) Menu No. : 54 (14.1MHz, CW) Transmit							
16. Carrier suppression • USB	1) Menu No. : 71 (14.1MHz, USB) Transmit	Spectrum analyzer 150W ATT			TX-RX (A/2)	VR621 VR622	Carrier level min.	50dB or more
	• LSB		2) Menu No. : 72 (14.1MHz, LSB) Transmit			Check		
17. Current protection	1) Menu No. : 67 (3.51MHz, USB) Transmit	Power meter 250W ATT			Remote control panel (front)	[▲] or [▼]	Set the adjustment value within the limit of the specified power.	110W±2W
	2) Menu No. : 67 (3.51MHz, USB) Transmit	DC V.M	TX-RX (A/2)	IP4	TX-RX (A/2)	VR2	2.25V	±0.25V
18. SWR protection	1) Menu No. : 73 (14.1MHz, CW) Transmit	150Ω dummy load Through type power meter 150W ATT	TX/RX unit rear panel	ANT1	Remote control panel (front)	[▲] or [▼]	Set the adjustment value within the limit of the specified power.	40W±1W
19. SWR meter • 14M (SWR : 3)	1) Menu No. : 74 (14.1MHz, CW) Transmit					[▲]	1 push	SWR meter lights up to 3 position.
	• 50M (SWR : 3)				2) Menu No. : 75 (51.9MHz, FM) Transmit			
• Writing data : After items 3~19 have been adjusted; 1) Menu No. : 76 2) [▲] or [▼] key : Push once time. Display “rEAdy” → “good” (If “nG” is displayed, enter data again.) 3) [MTR] key : Push once time.								
20. AT detection balance	1) Display f. : 51.9MHz Mode : FM Power : 10W Transmit	Oscilloscope Power meter	TX-RX (A/2)	AMD	Final (C/3)	VR502	Turn the VR502 to the point where the waveform on the oscilloscope changes from high to low. (Threshold point)	



## ADJUSTMENT

### Adjustment Points (Upper Side)

#### FINAL UNIT (C/3) : TS-480HX

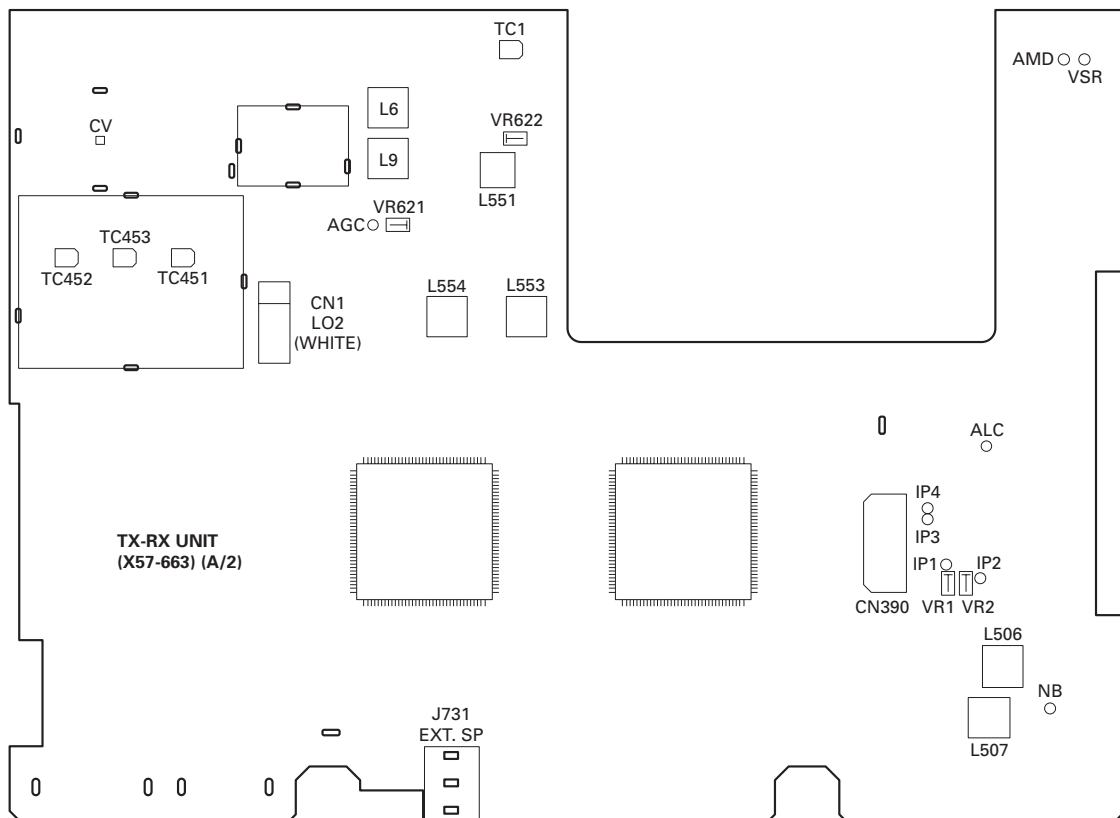
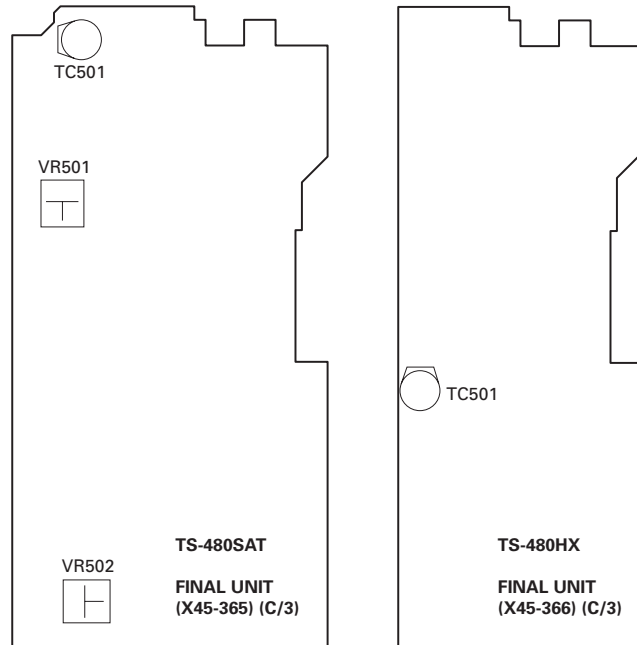
TC501 : Null

#### FINAL UNIT (C/3) : TS-480SAT

VR501 : TX power

VR502 : AT detection balance

TC501 : Null



#### TX-RX UNIT (A/2)

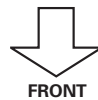
TC1 : LO2 (62.4MHz) frequency

L6,9 : LO2 level

TC451 : Lock voltage (VCO2)

TC452 : Lock voltage (VCO1)

TC453 : Lock voltage (VCO3)



L553,554 : RF IF gain

L551 : FM discriminator

L506,507 : NB gain

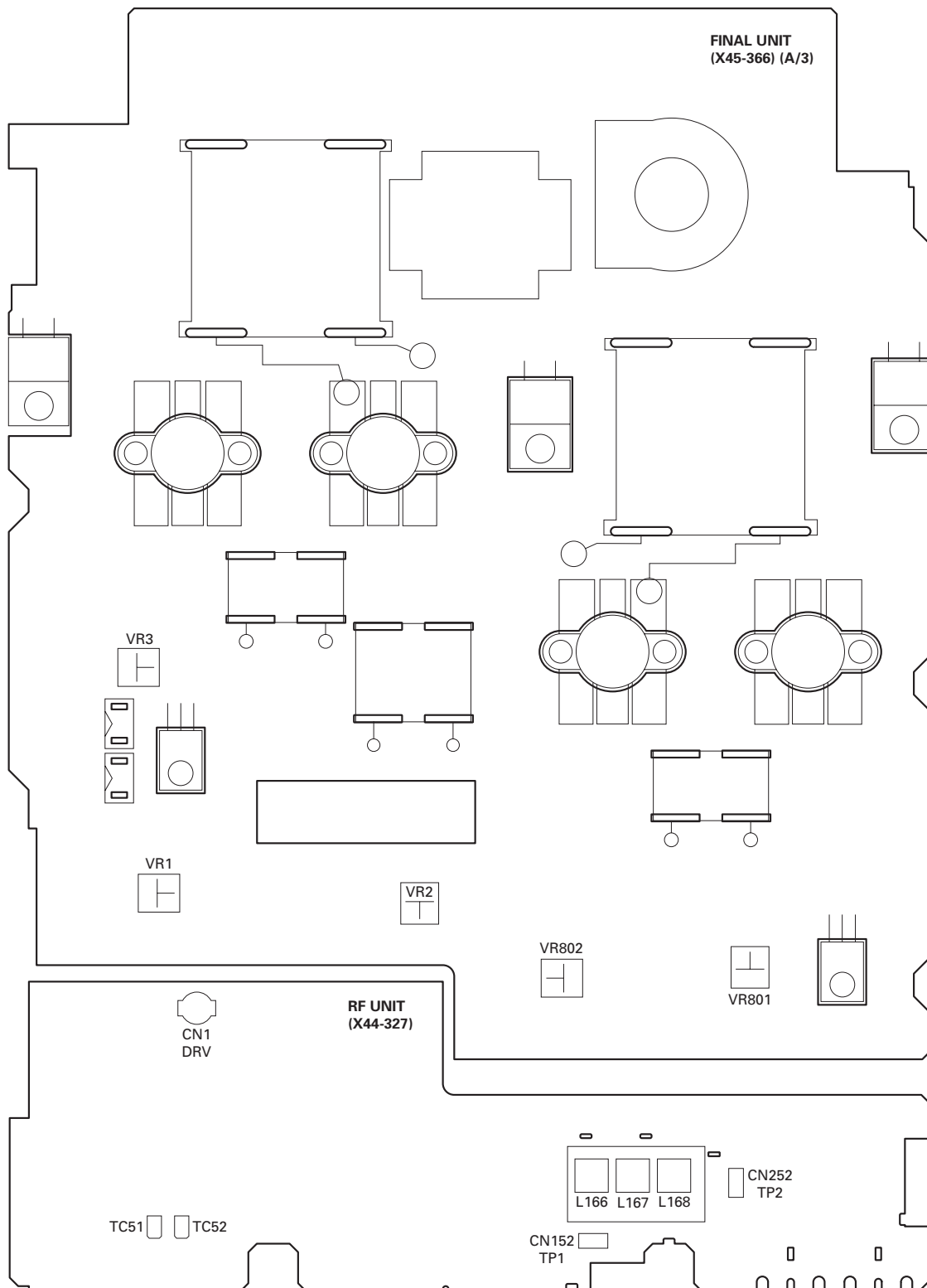
VR1,2 : Current protection

VR621,622 : Carrier suppression

# TS-480HX/480SAT

## ADJUSTMENT

### Adjustment Points (Lower Side) : TS-480HX



#### FINAL UNIT (A/3)

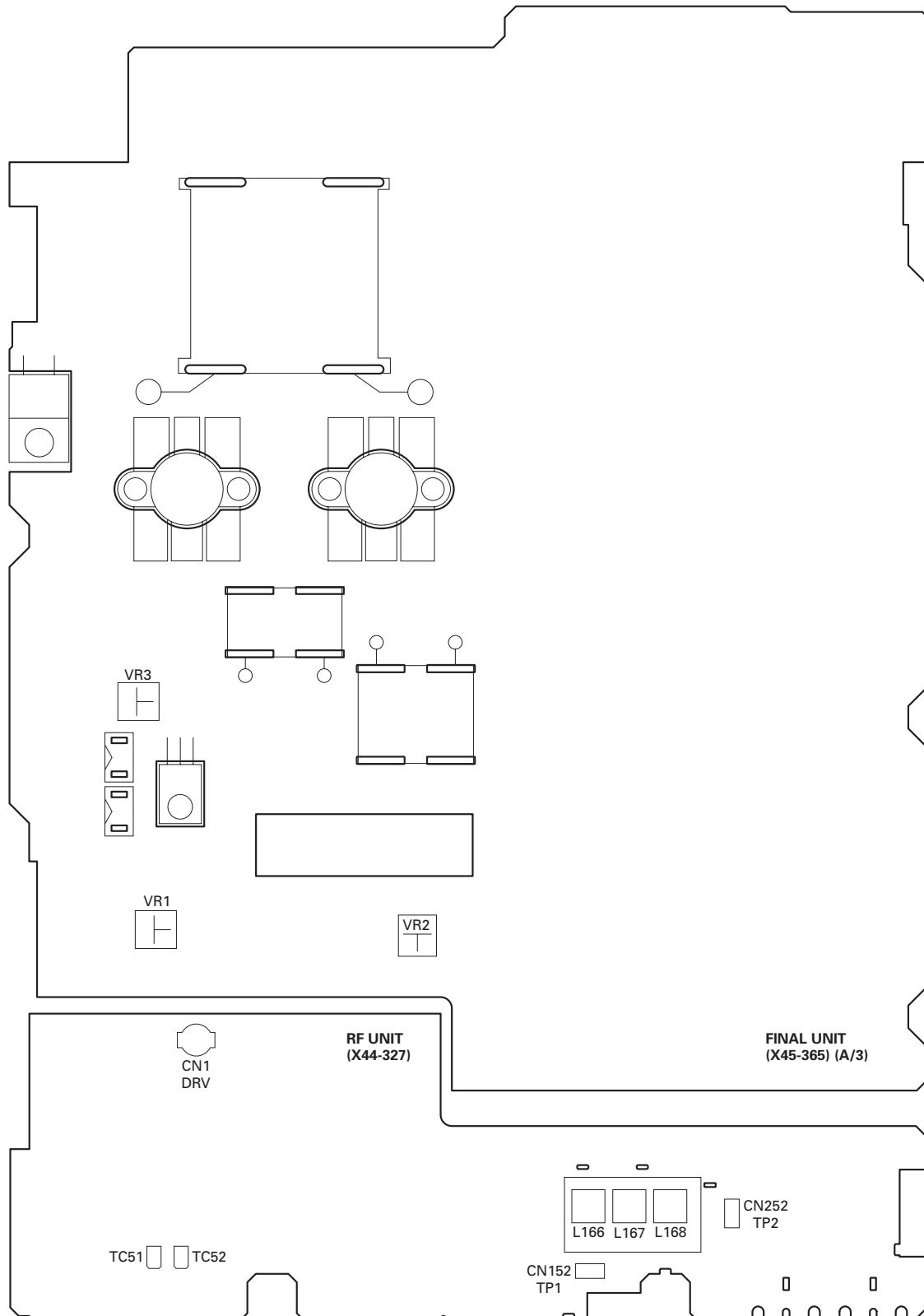
VR1,2,3,801 : Final idling current  
VR802 : ODP (Over Drive Protection)

#### RF UNIT

L166,167,168 : MCF (73.095MHz)  
TC51 : Trap frequency (11.7MHz)  
TC52 : Trap frequency (15.5MHz)

## ADJUSTMENT

### Adjustment Points (Lower Side) : TS-480SAT



#### FINAL UNIT (A/3)

VR1,2,3 : Final idling current



#### RF UNIT

L166,167,168 : MCF (73.095MHz)

TC51 : Trap frequency (11.7MHz)

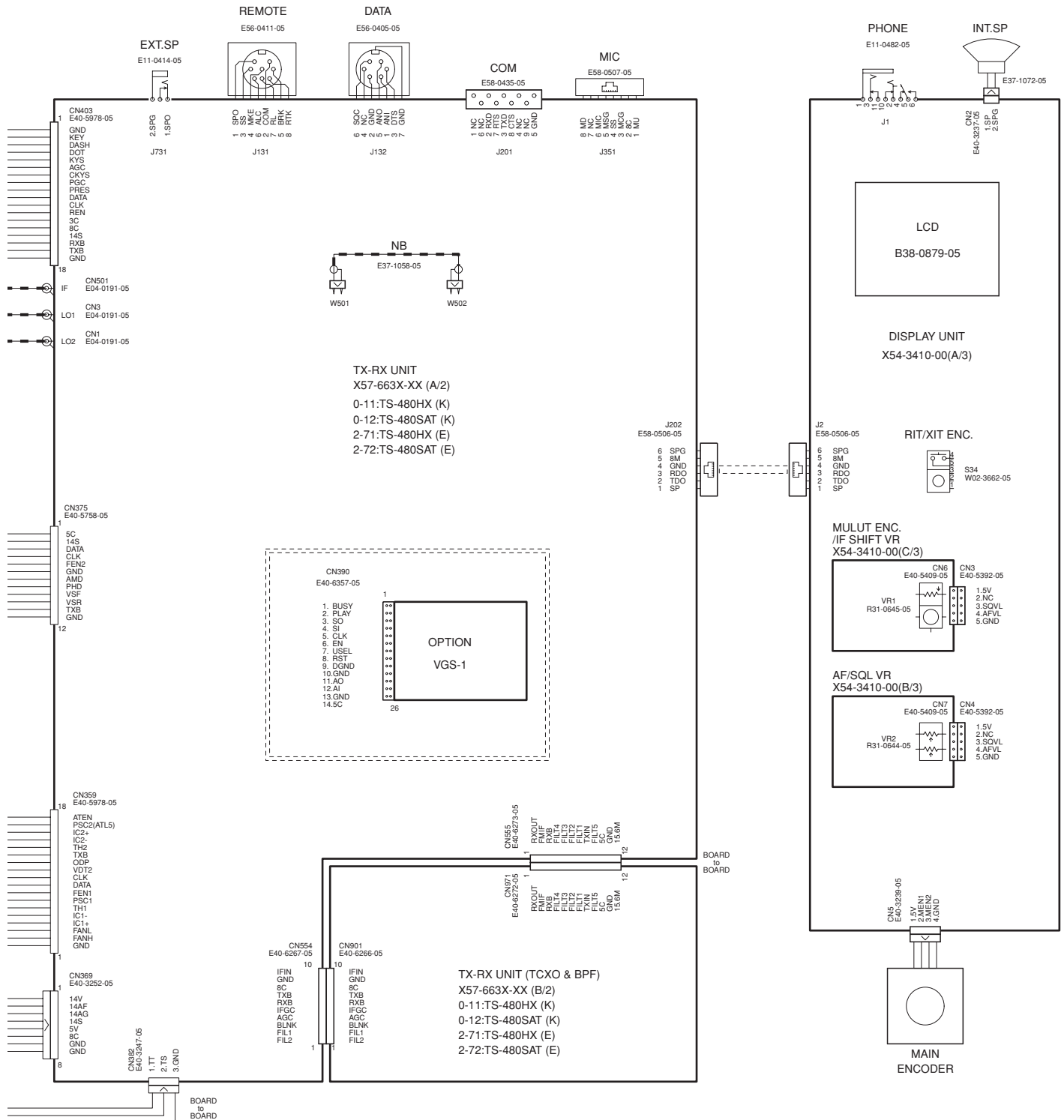
TC52 : Trap frequency (15.5MHz)

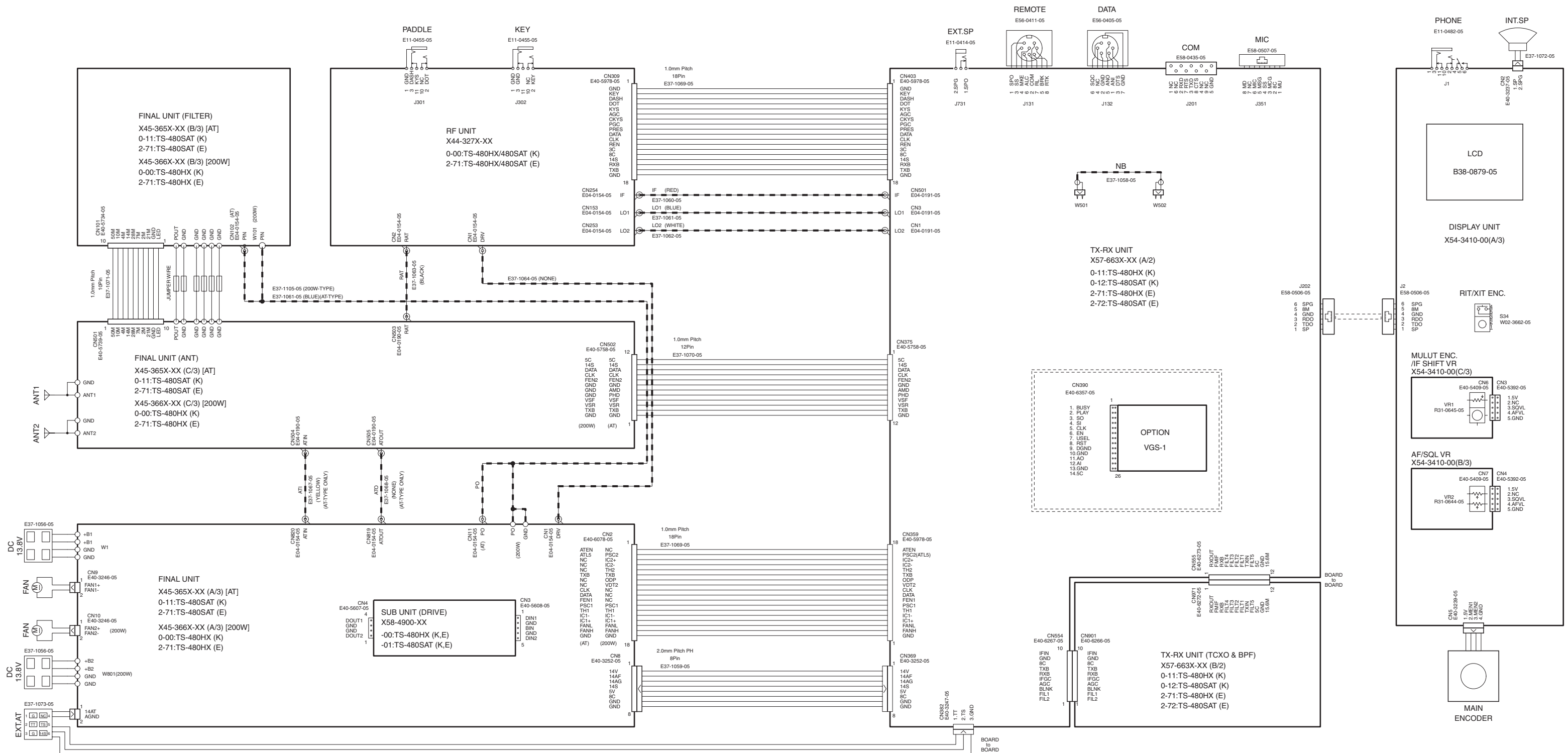
## 76



# TS-480HX/480SAT

## INTERCONNECTION DIAGRAM

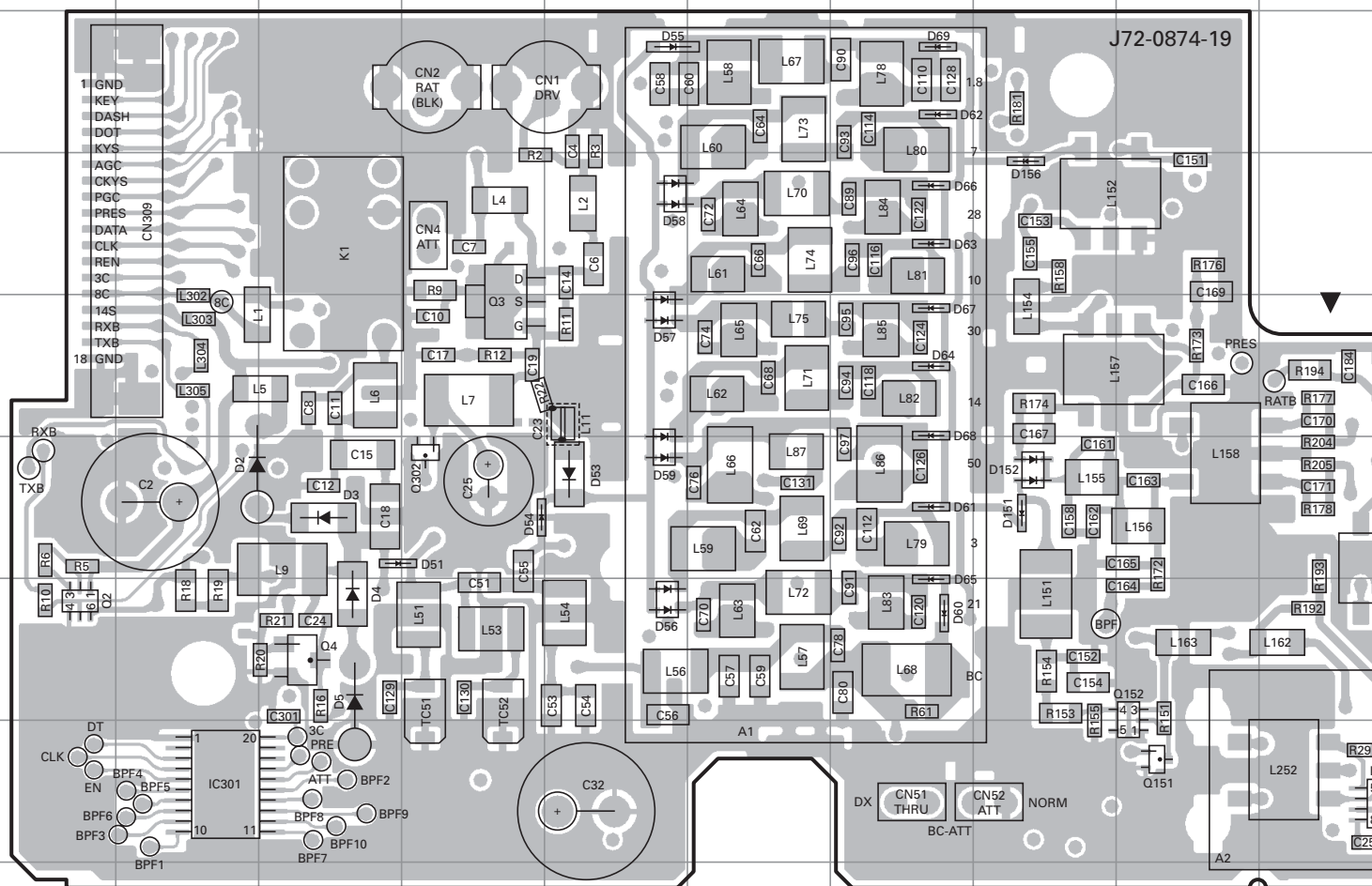






# TS-480HX/480SAT PC BOARD

**RF UNIT (X44-327X-XX) 0-00 : KH,KS 2-71 : EH,ES**  
**Component side view (J72-0874-19)**



Ref. No.	Address	Ref. No.	Address	Ref. No.	Address	Ref. No.	Address
IC251	8J	D2	6B	D57	5E	D66	4G
IC301	8B	D3	6C	D58	4E	D67	5G
Q2	7A	D4	7C	D59	6E	D68	5G
Q3	5D	D5	7C	D60	7G	D69	3G
Q4	7C	D51	6D	D61	6G	D151	6H
Q151	8I	D53	6E	D62	3G	D152	6H
Q152	7I	D54	6D	D63	4G	D156	4H
Q251	8O	D55	3E	D64	5G	D253	5O
Q302	6D	D56	7E	D65	7G	D256	6Q

**RF UNIT (X44-327X-XX) 0-00 : KH,KS 2-71 : EH,ES**  
**Component side view (J72-0874-19)**

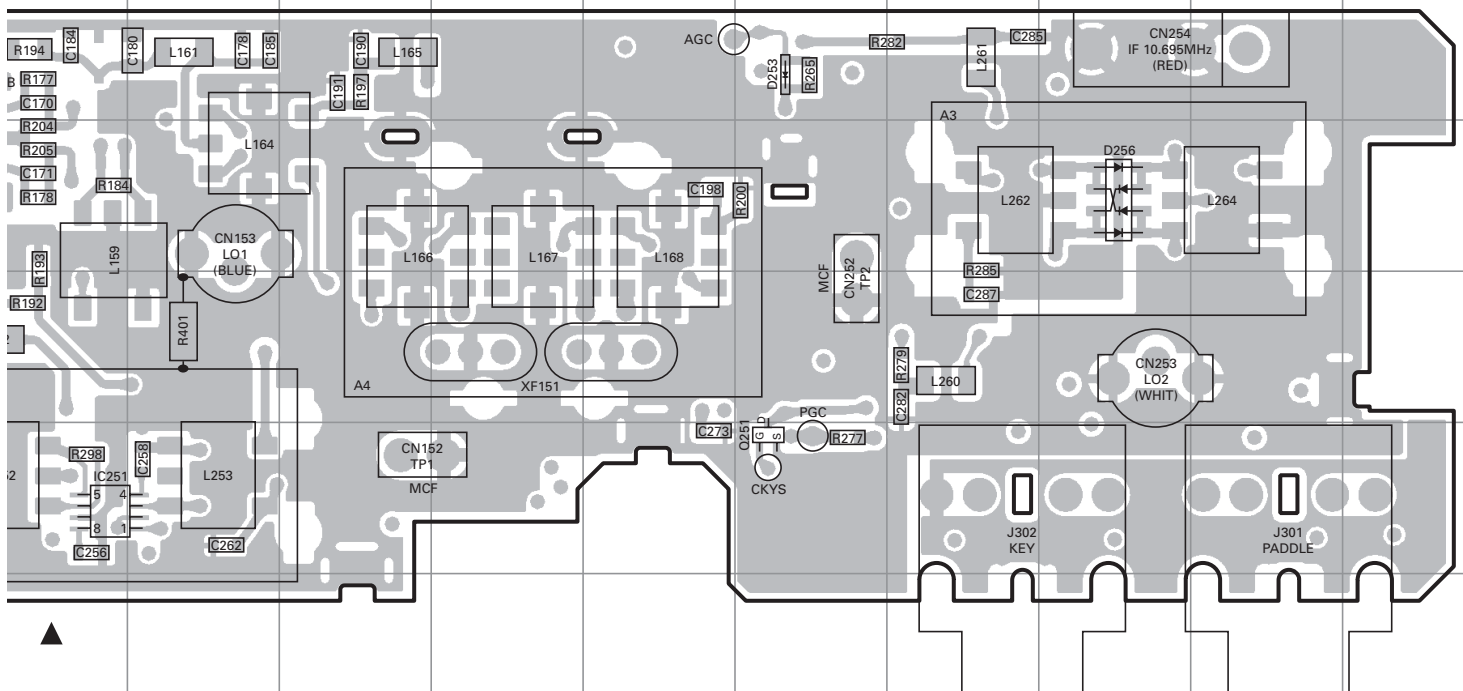


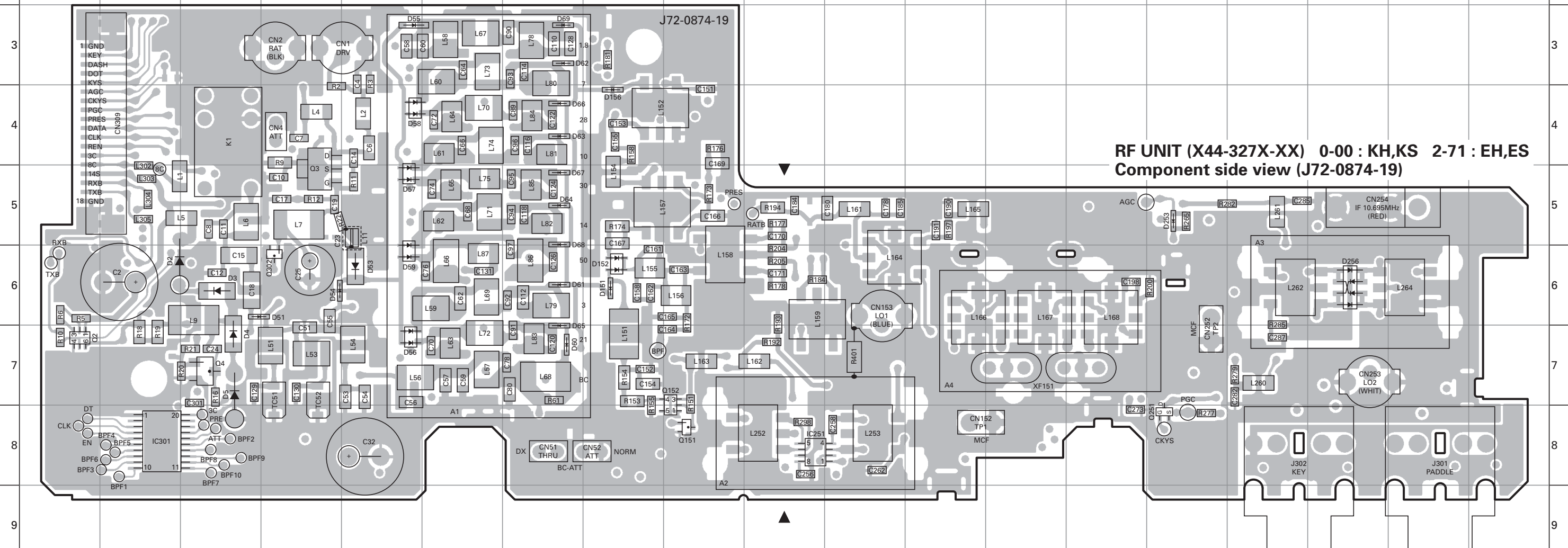
Diagram illustrating the structure of a four-layer laminate:

- Layer 1 (Top layer, shaded gray)
- Layer 2 (Second layer, white)
- Layer 3 (Third layer, white)
- Layer 4 (Bottom layer, white)

The top surface is labeled "Component side" and the bottom surface is labeled "Foil side".

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S		
1	TS-480HX/480SAT PC BOARD													PC BOARD		TS-480HX/480SAT					1

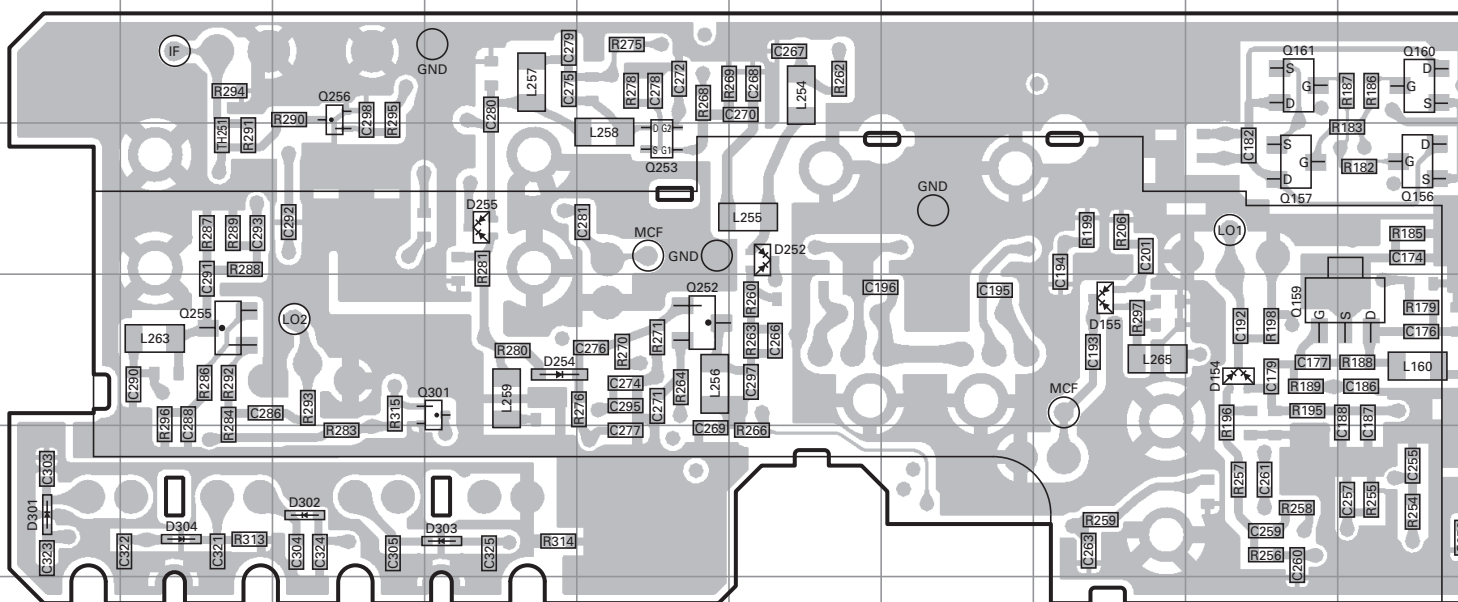
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S			
1	TS-480HX/480SAT						PC BOARD								PC BOARD		TS-480HX/480SAT					1

[illegible][illegible]

11	Q2	7A	D4	7C	D59	6E	D68	5G	<div> <div>Component side</div> <div> <div>Layer 1</div> <div>Layer 2</div> <div>Layer 3</div> <div>Layer 4</div> </div> <div>Foil side</div> </div>	11
	Q3	5D	D5	7C	D60	7G	D69	3G		
	Q4	7C	D51	6D	D61	6G	D151	6H		
	Q151	8I	D53	6E	D62	3G	D152	6H		
	Q152	7I	D54	6D	D63	4G	D156	4H		
	Q251	8O	D55	3E	D64	5G	D253	5O		
	Q252	8P	D56	3E	D65	5G	D254	5O		

# TS-480HX/480SAT PC BOARD

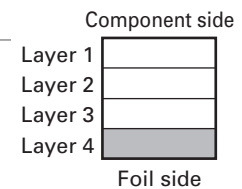
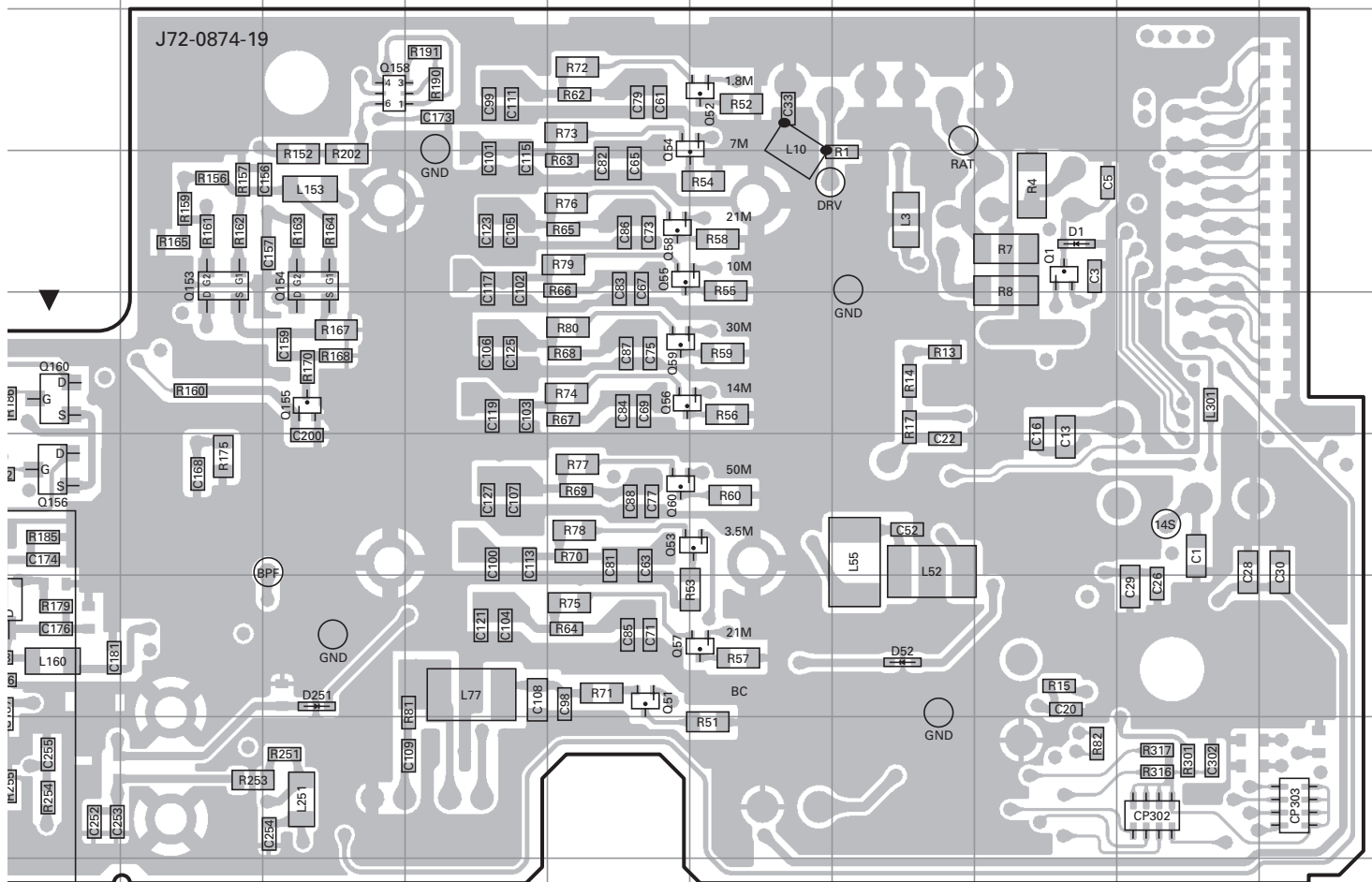
**RF UNIT (X44-327X-XX) 0-00 : KH,KS 2-71 : EH,ES**  
**Foil side view (J72-0874-19)**



Ref. No.	Address	Ref. No.	Address	Ref. No.	Address	Ref. No.	Address	Ref. No.	Address
Q1	4Q	Q58	4N	Q158	3L	Q301	7D	D255	6D
Q51	7N	Q59	5N	Q159	7J	D1	4Q	D301	8A
Q52	3O	Q60	6N	Q160	5J	D52	7P	D302	8C
Q53	6O	Q153	4K	Q161	5I	D154	7I	D303	8D
Q54	3O	Q154	4L	Q252	7E	D155	7H	D304	8B
Q55	4N	Q155	5L	Q253	6E	D251	7L		
Q56	5N	Q156	6J	Q255	7B	D252	6F		
Q57	7O	Q157	6I	Q256	5C	D254	7D		

# PC BOARD TS-480HX/480SAT

RF UNIT (X44-327X-XX) 0-00 : KH,KS 2-71 : EH,ES  
Foil side view (J72-0874-19)



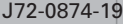
# PC BOARD

# PC BOARD

### Foil side view (J72-0874-19)

RF UNIT (X44-327X-XX) 0-00 : KH,KS 2-71 : EH,ES

### Foil side view (J72-0874-19)



Ref. No.	Address	Ref. No.	Address	Ref. No.	Address	Ref. No.	Address	Ref. No.	Address
Q1	4Q	Q58	4N	Q158	3L	Q301	7D	D255	6D
Q51	7N	Q59	5N	Q159	7J	D1	4Q	D301	8A
Q52	3O	Q60	6N	Q160	5J	D52	7P	D302	8C
Q53	6O	Q153	4K	Q161	5I	D154	7I	D303	8D
Q54	3O	Q154	4L	Q252	7E	D155	7H	D304	8B
Q55	4N	Q155	5L	Q253	6E	D251	7L		
Q56	5N	Q156	6J	Q255	7B	D252	6F		
Q57	7O	Q157	6I	Q256	5C	D254	7D		

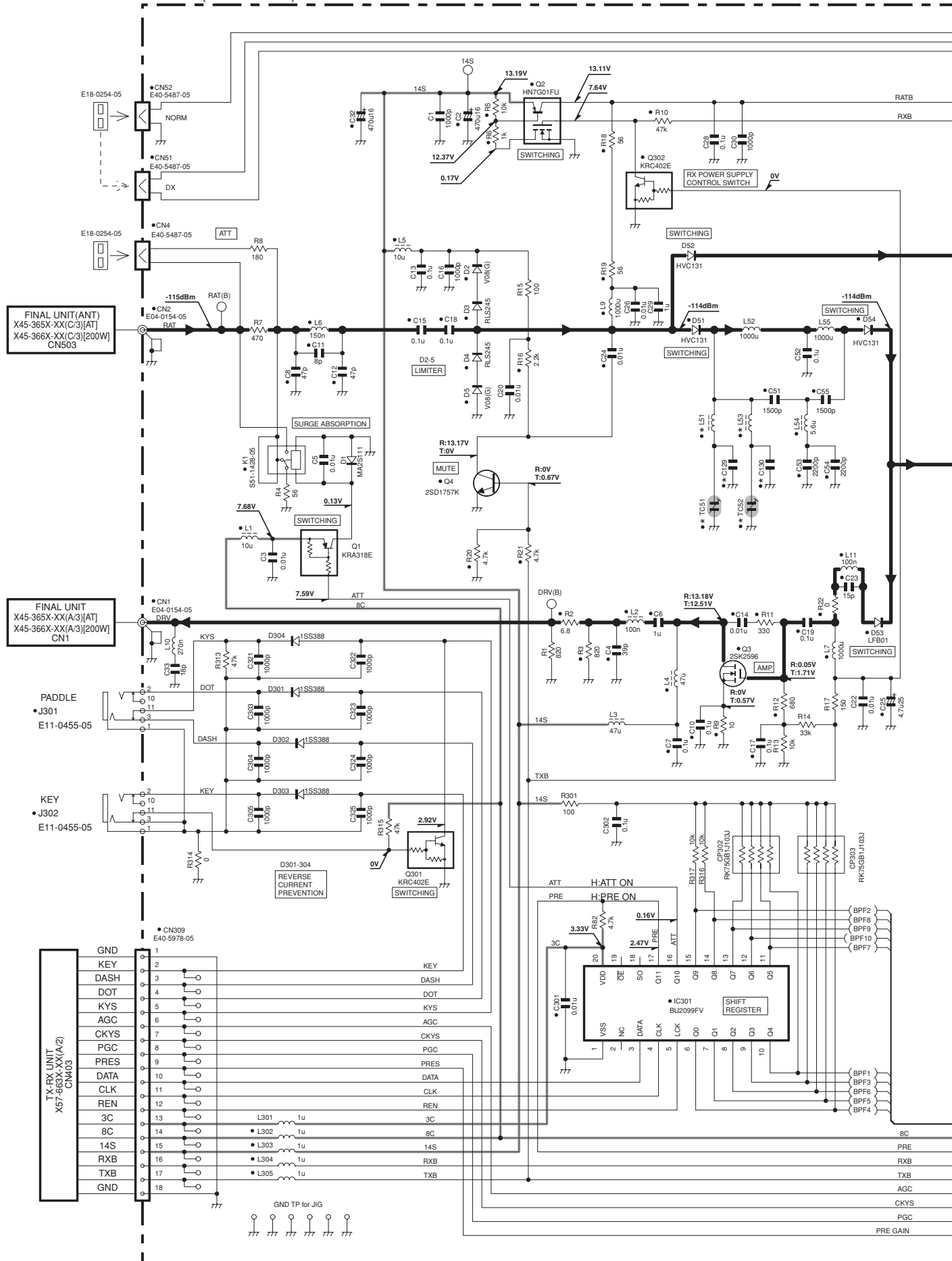
Layer 1	
Layer 2	
Layer 3	
Layer 4	

Foil side



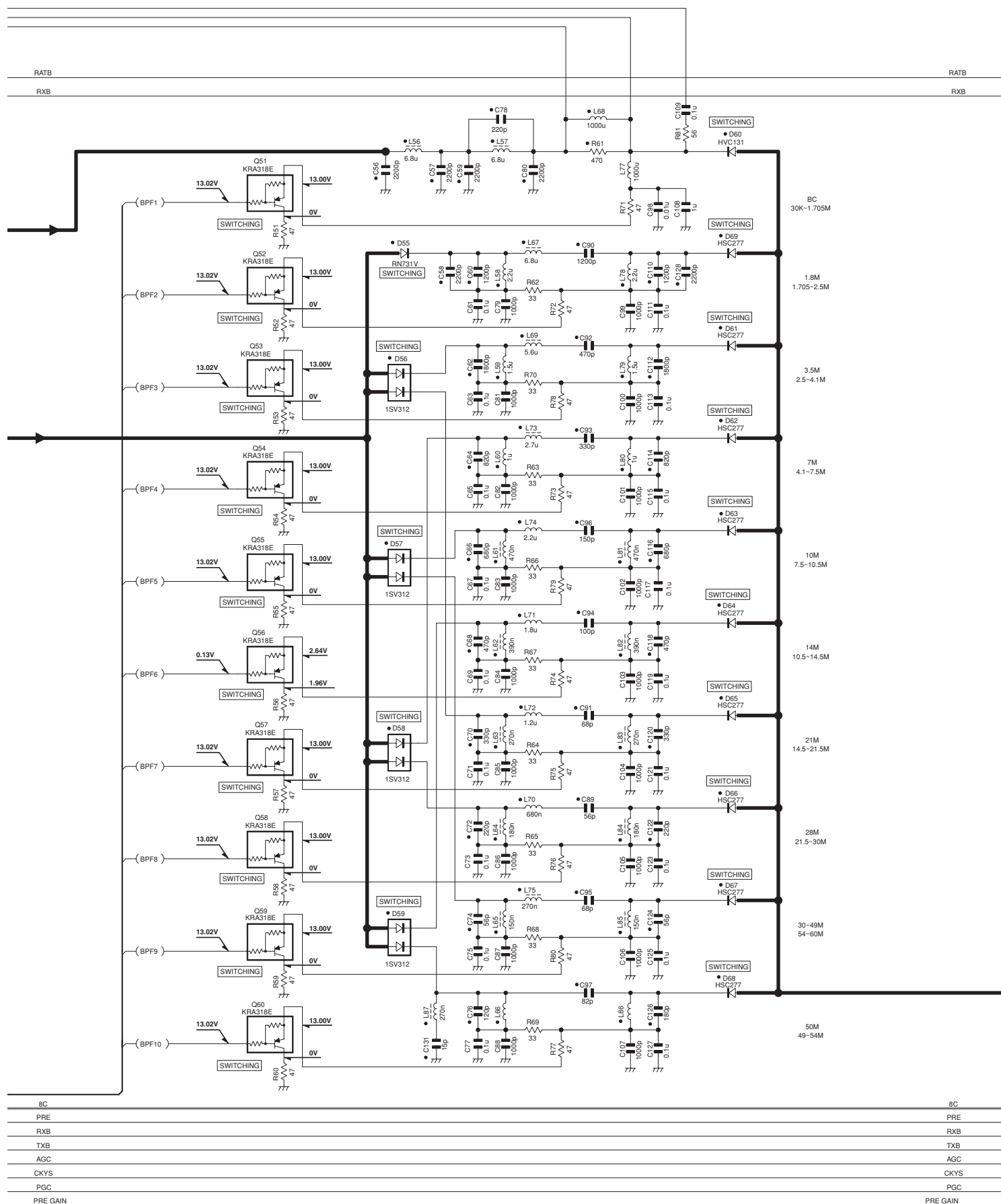
# TS-480HX/480SAT SCHEMATIC DIAGRAM

RF UNIT (X44-327X-XX)



# SCHEMATIC DIAGRAM TS-480HX/480SAT

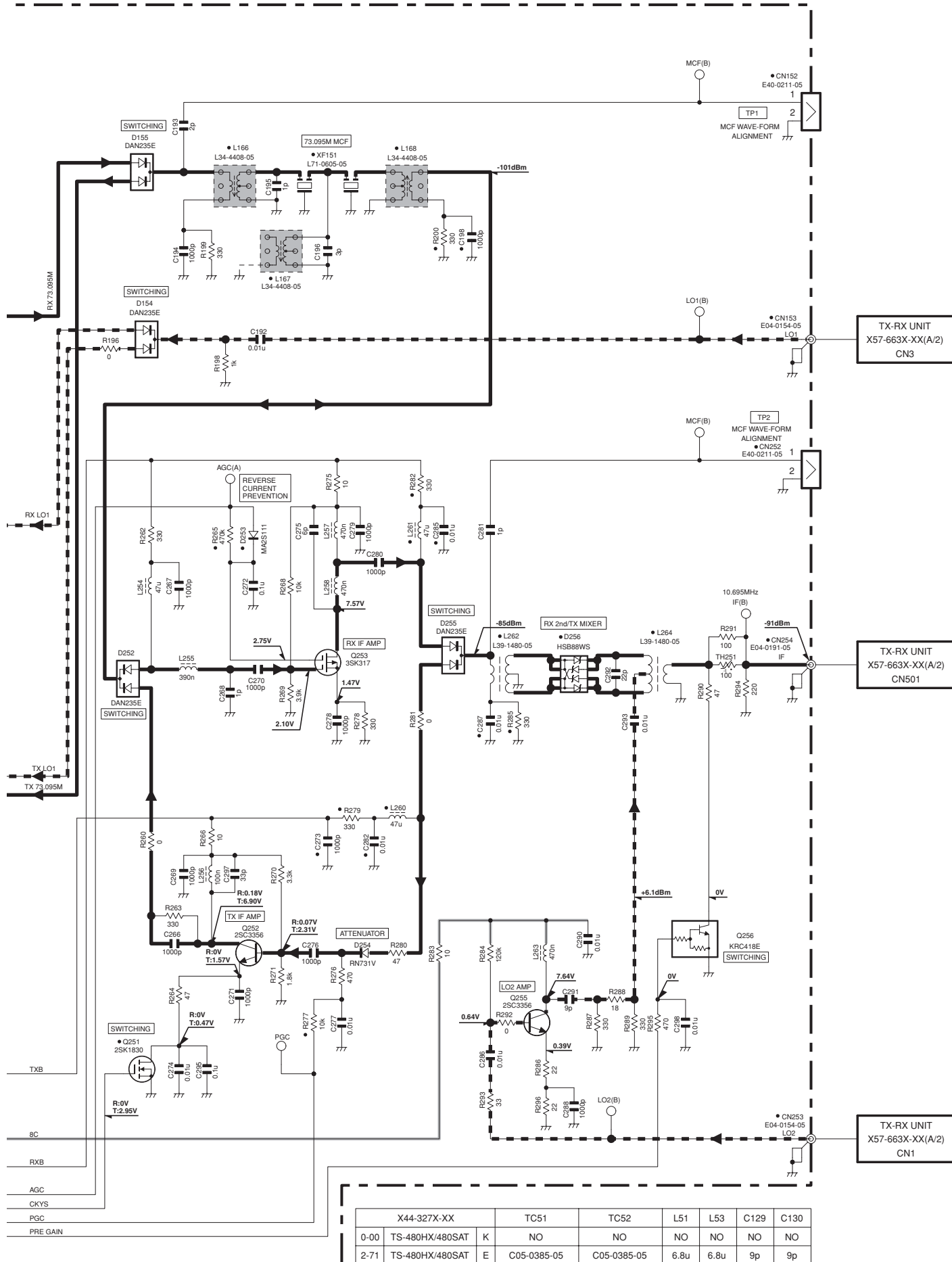
RF UNIT (X44-327X-XX)

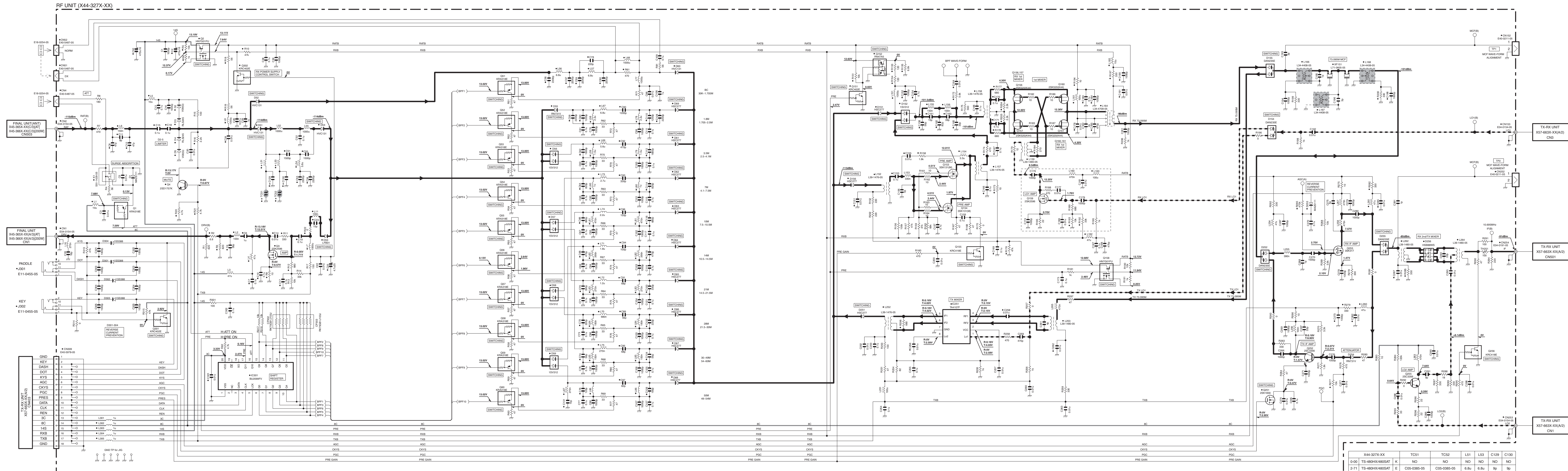


## RF UNIT (X44-327X-XX)



RF UNIT (X44-327X-XX)

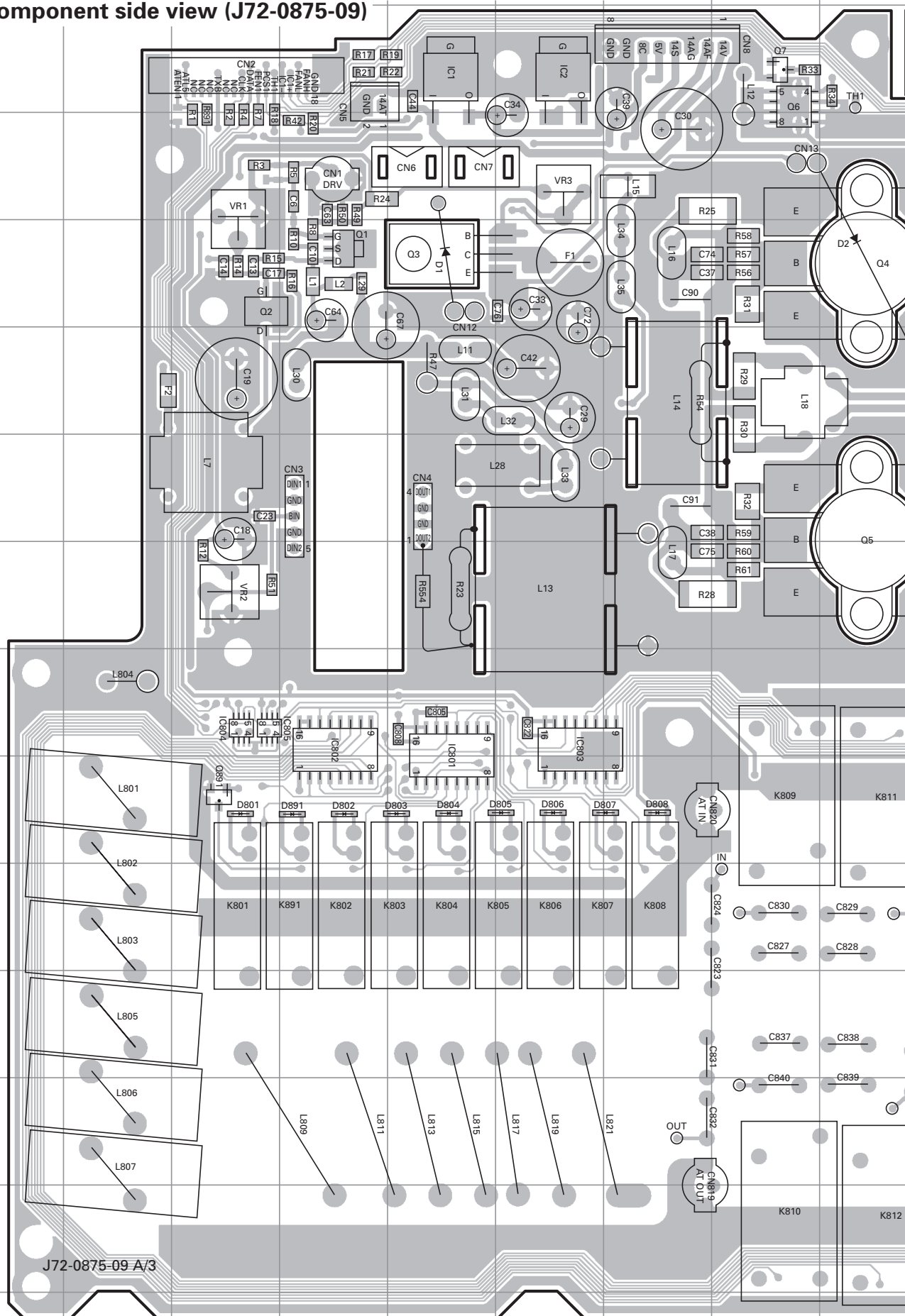




X44-327X-XX			TC51	TC52	L51	L53	C129	C131
0-00	TS-480HX/480SAT	K	NO	NO	NO	NO	NO	NO
2-71	TS-480HX/480SAT	E	C05-0385-05	C05-0385-05	6.8u	6.8u	9p	9p

# TS-480HX/480SAT PC BOARD

100W FINAL UNIT (X45-365X-XX) (A/3) 0-11 : KS 2-71 : ES  
Component side view (J72-0875-09)



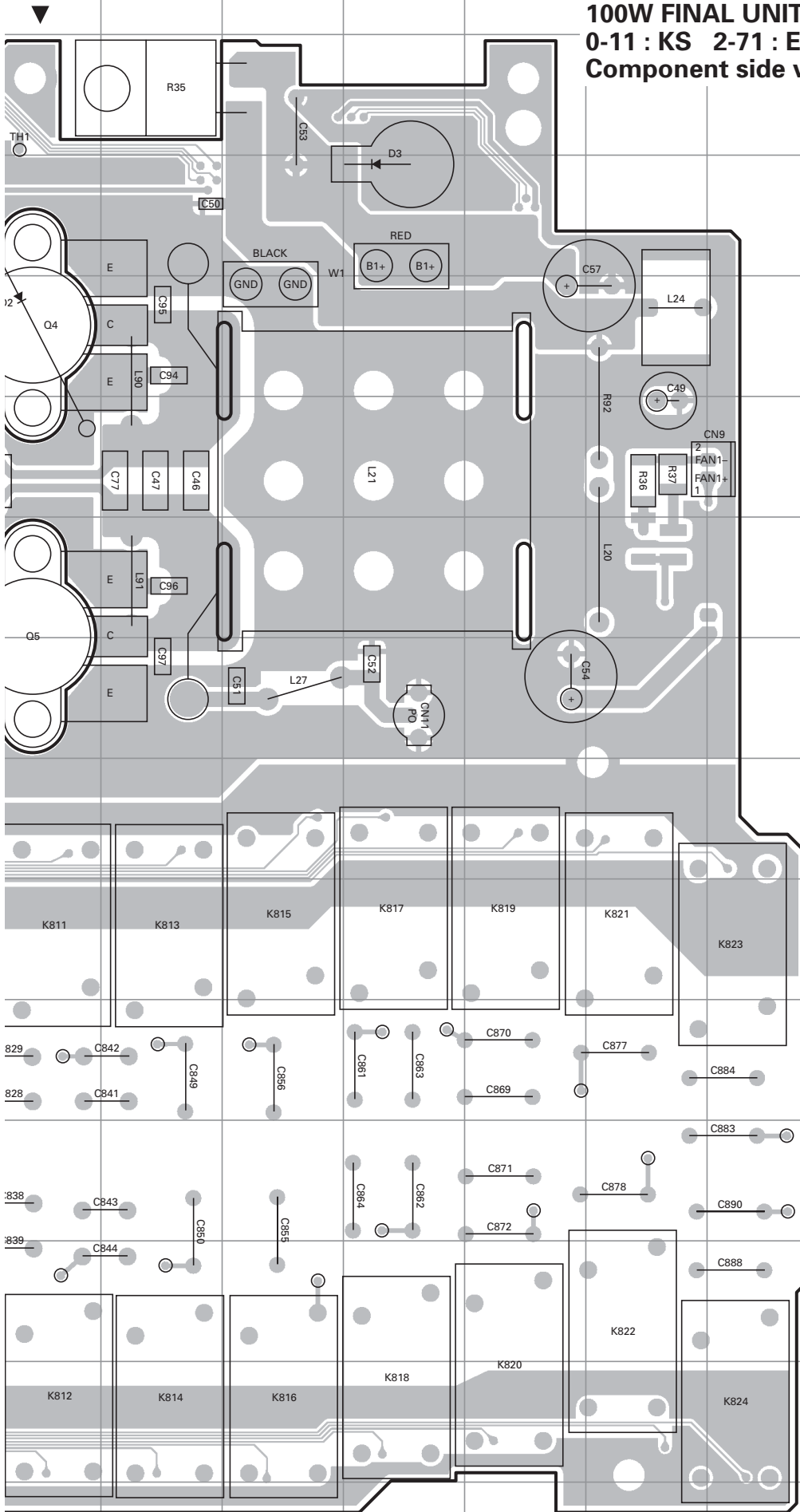


# PC BOARD TS-480HX/480SAT

100W FINAL UNIT (X45-365X-XX) (A/3)

0-11 : KS 2-71 : ES

Component side view (J72-0875-09)



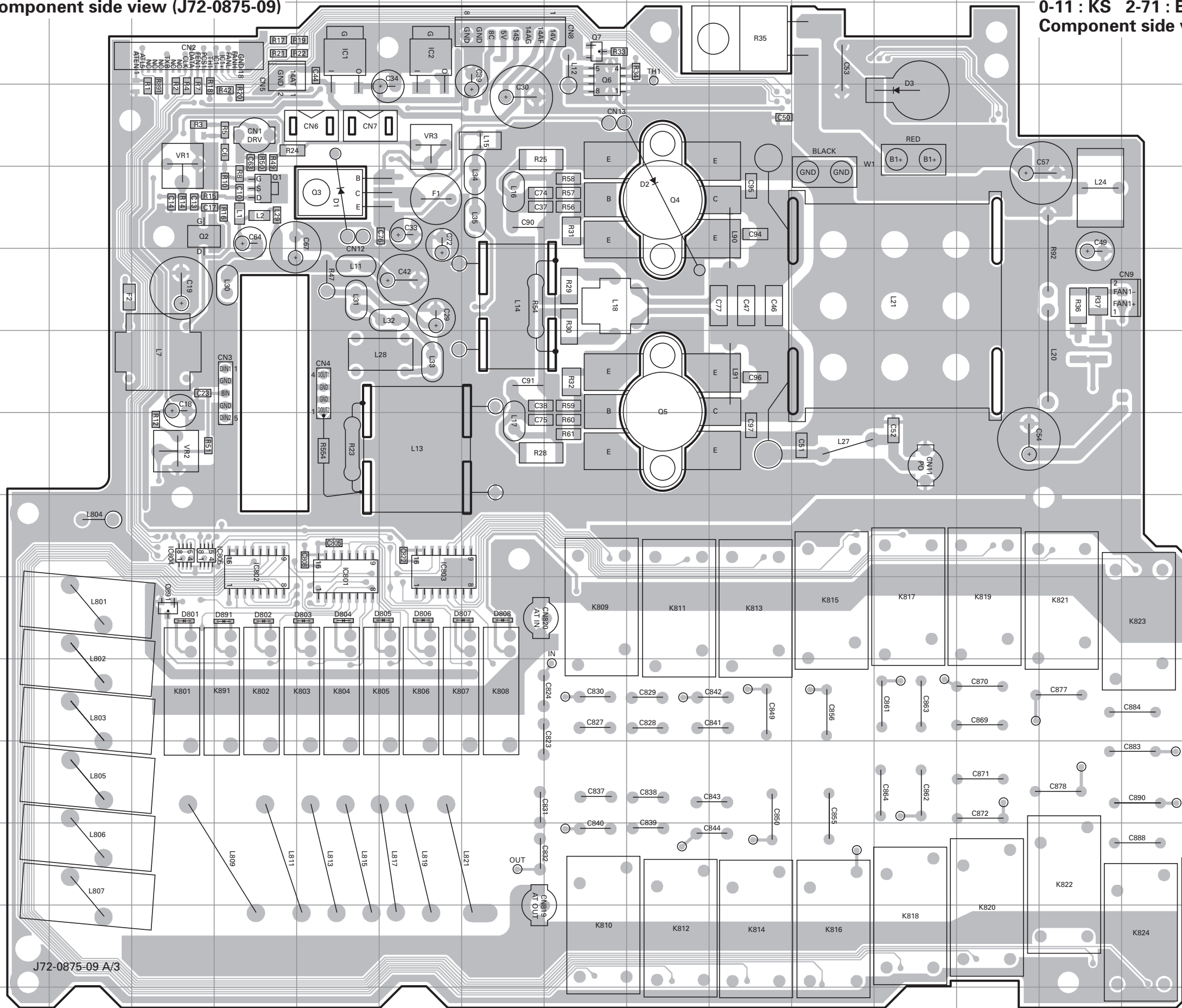
Ref. No.	Address
IC1	2F
IC2	2G
IC801	8F
IC802	8E
IC803	8G
IC804	8D
IC805	8D
Q1	4E
Q2	4D
Q3	4F
Q4	4J
Q5	6J
Q6	2I
Q7	2I
Q891	9D
D1	4F
D2	4J
D3	3M
D801	9D
D802	9E
D803	9F
D804	9F
D805	9G
D806	9G
D807	9H
D808	9H
D891	9E

Component side  
 Layer 1  
 Layer 2  
 Foil side



# TS-480HX/480SAT PC BOARD

**100W FINAL UNIT (X45-365X-XX) (A/3) 0-11 : KS 2-71 : ES**  
**Component side view (J72-0875-09)**



## PC BOARD TS-480HX/480SAT

**100W FINAL UNIT (X45-365X-XX) (A/3)**  
**0-11 : KS 2-71 : ES**  
**Component side view (J72-0875-09)**

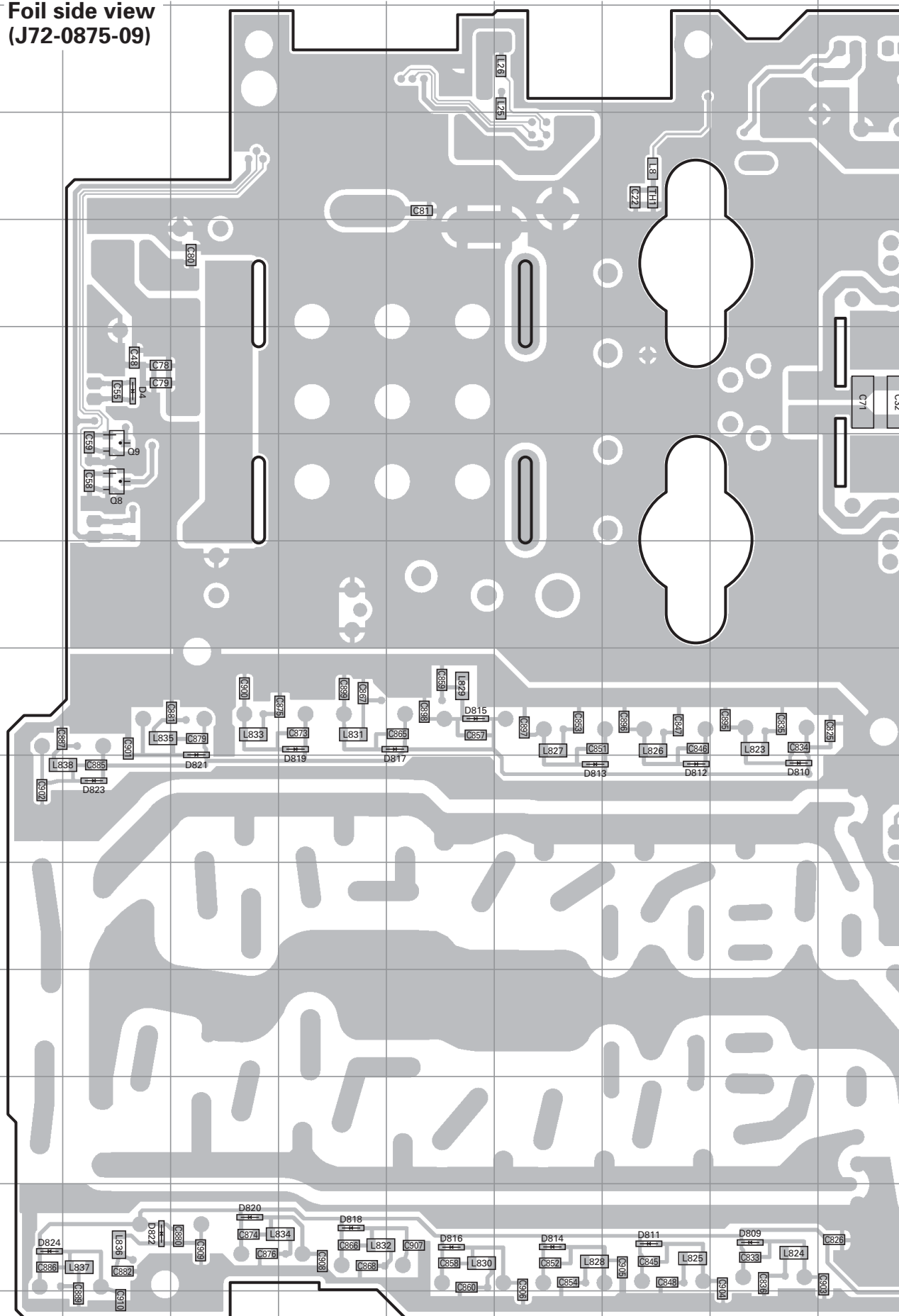
Ref. No.	Address
IC1	2F
IC2	2G
IC801	8F
IC802	8E
IC803	8G
IC804	8D
IC805	8D
Q1	4E
Q2	4D
Q3	4F
Q4	4J
Q5	6J
Q6	2I
Q7	2I
Q891	9D
D1	4F
D2	4J
D3	3M
D801	9D
D802	9E
D803	9F
D804	9F
D805	9G
D806	9G
D807	9H
D808	9H
D891	9E

Diagram illustrating the cross-section of a two-layer material. The top layer is labeled "Layer 1" and the bottom layer is labeled "Layer 2". The top surface is labeled "Component side" and the bottom surface is labeled "Foil side".

# TS-480HX/480SAT PC BOARD

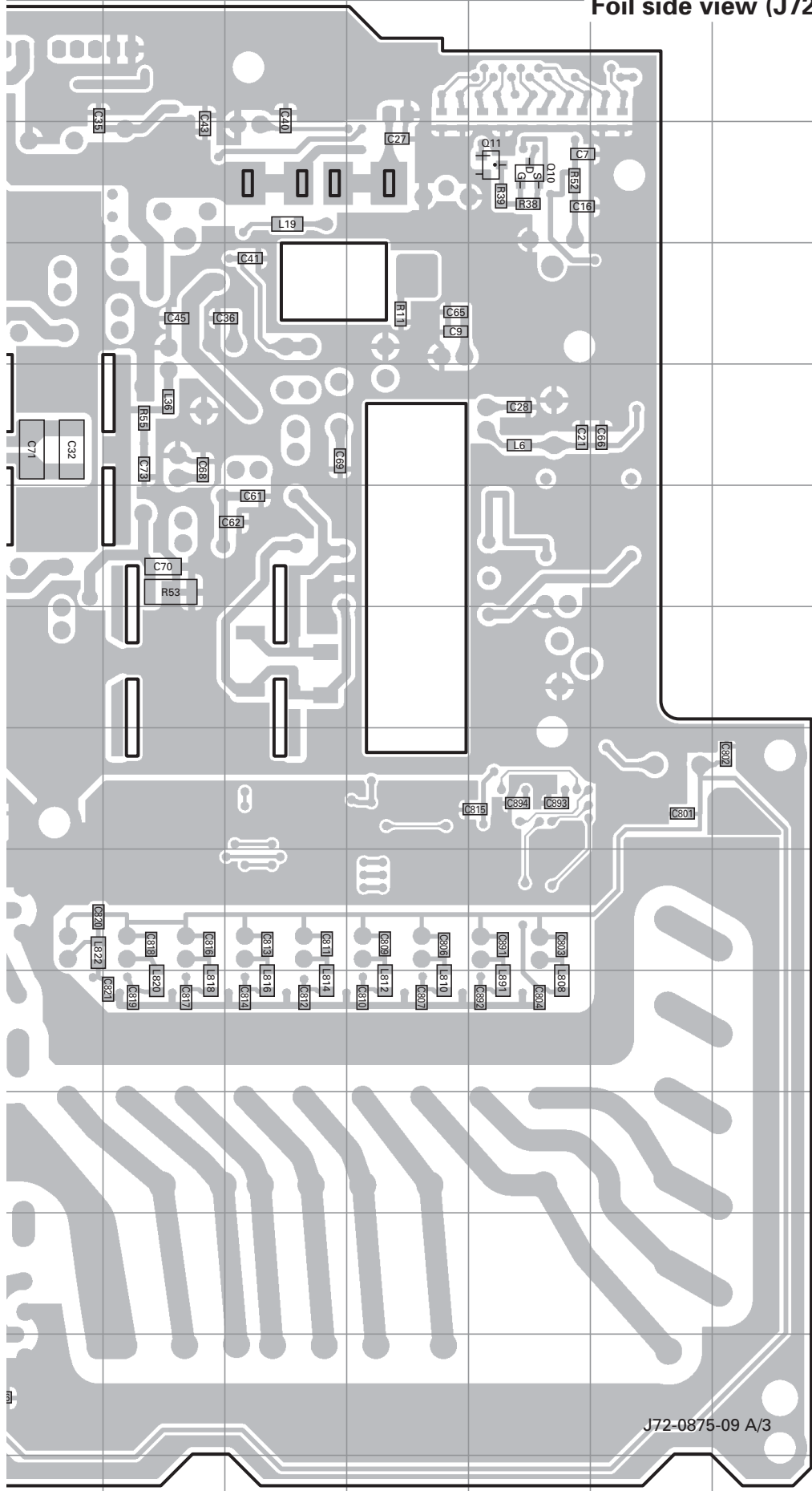
100W FINAL UNIT (X45-365X-XX) (A/3) 0-11 : KS 2-71 : ES

Foil side view  
(J72-0875-09)

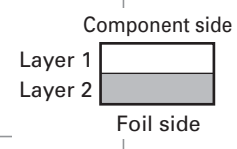


# PC BOARD TS-480HX/480SAT

100W FINAL UNIT (X45-365X-XX) (A/3) 0-11 : KS 2-71 : ES  
Foil side view (J72-0875-09)



Ref. No.	Address
Q8	6C
Q9	6C
Q10	3N
Q11	3N
D4	5C
D809	13I
D810	9I
D811	13H
D812	9H
D813	9G
D814	13G
D815	8F
D816	13F
D817	8F
D818	13E
D819	8E
D820	13D
D821	8D
D822	13C
D823	9C
D824	13B



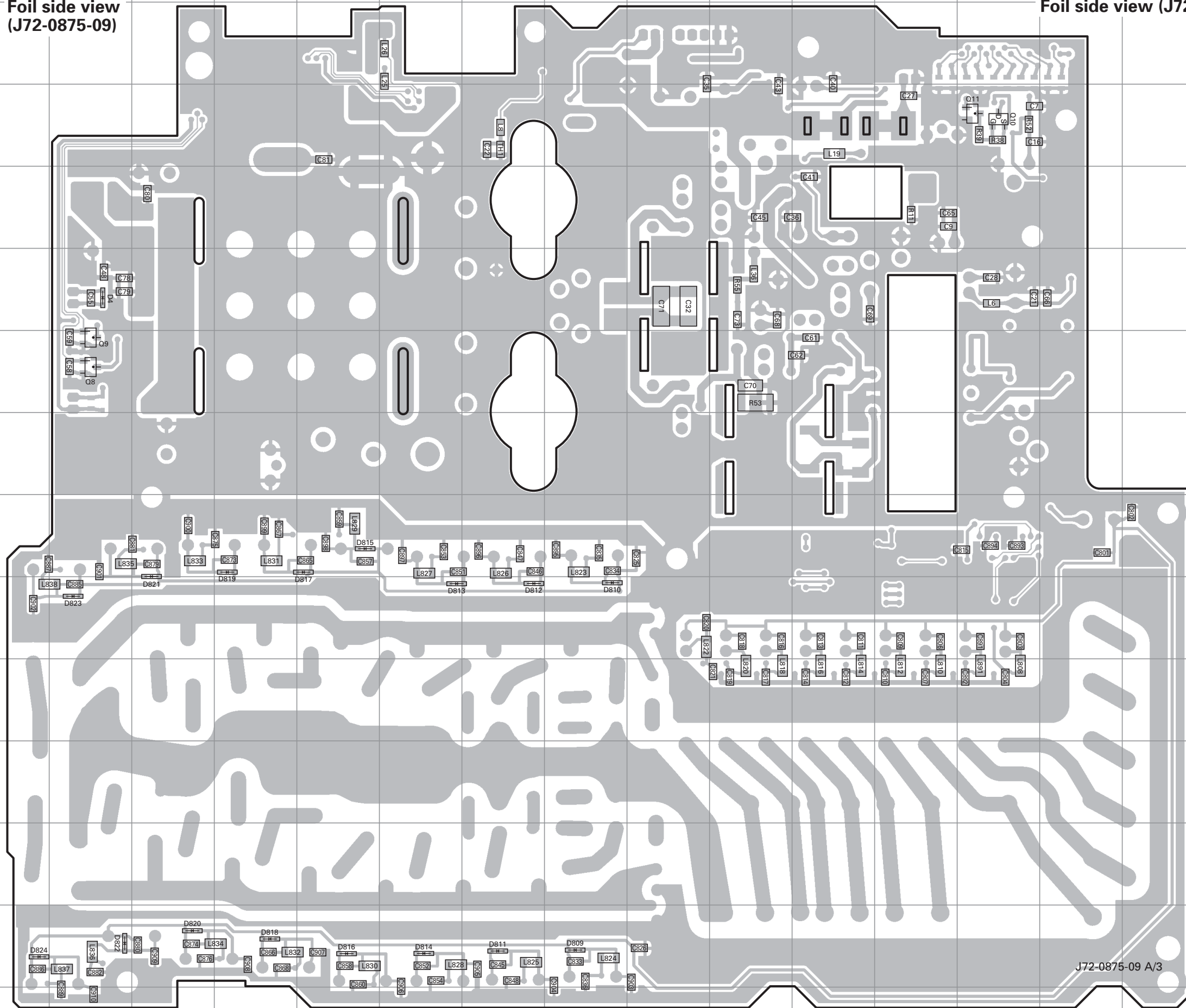
J72-0875-09 A/3

TS-480HX/480SAT PC BOARD

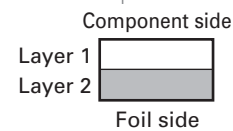
100W FINAL UNIT (X45-365X-XX) (A/3) 0-11 : KS 2-71 : ES  
Foil side view  
(J72-0875-09)

PC BOARD TS-480HX/480SAT

100W FINAL UNIT (X45-365X-XX) (A/3) 0-11 : KS 2-71 : ES  
Foil side view (J72-0875-09)



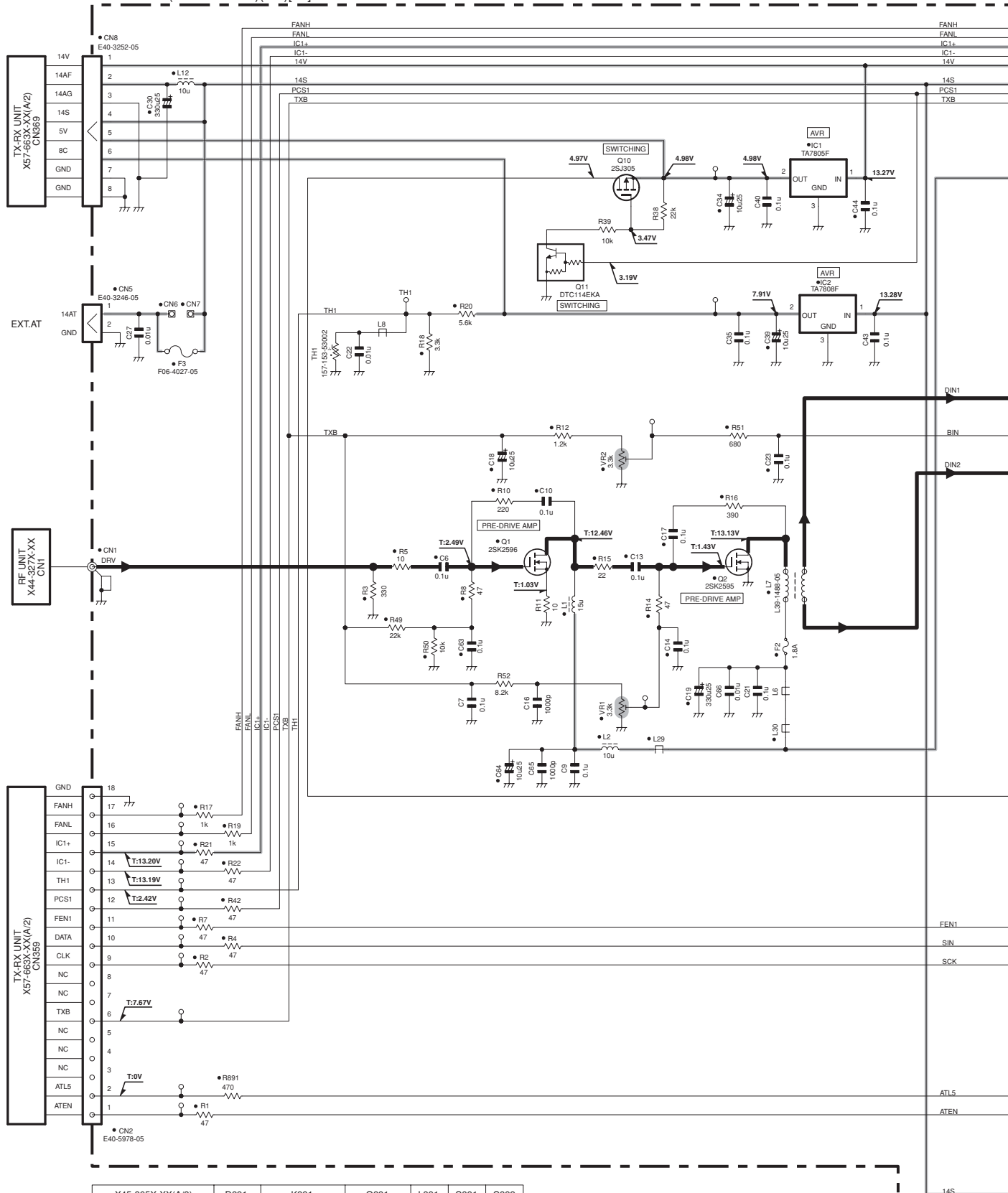
Ref. No.	Address
Q8	6C
Q9	6C
Q10	3N
Q11	3N
D4	5C
D809	13I
D810	9I
D811	13H
D812	9H
D813	9G
D814	13G
D815	8F
D816	13F
D817	8F
D818	13E
D819	8E
D820	13D
D821	8D
D822	13C
D823	9C
D824	13B



J72-0875-09 A/3

# TS-480HX/480SAT SCHEMATIC DIAGRAM

FINAL UNIT (X45-365X-XX)(A/3)[AT]



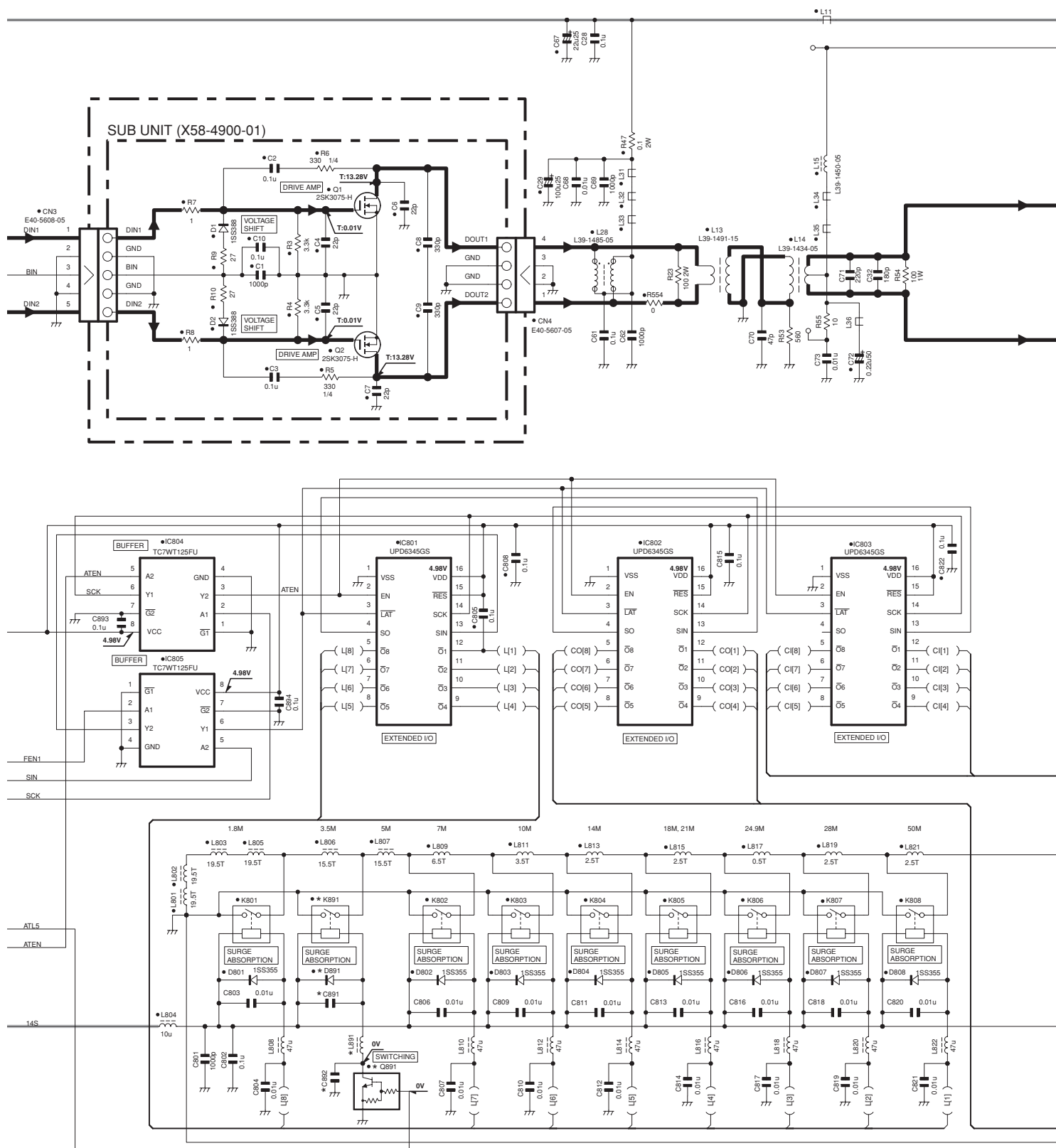
X45-365X-XX(A/3)	D891	K891	Q891	L891	C891	C892
0-11 TS-480SAT	K 1SS355	S76-0415-05	DTC114EKA	47u	0.01u	0.01u
2-71 TS-480SAT	E NO	NO	NO	NO	NO	NO

# SCHEMATIC DIAGRAM TS-480HX/480SAT

FINAL UNIT (X45-365X-XX) (A/3)

FANH  
FANL  
IC1+  
IC1-  
14V  
14S  
PC51  
TXB

FANH  
FANL  
IC1+  
IC1-  
14V  
14S  
PC51  
TXB

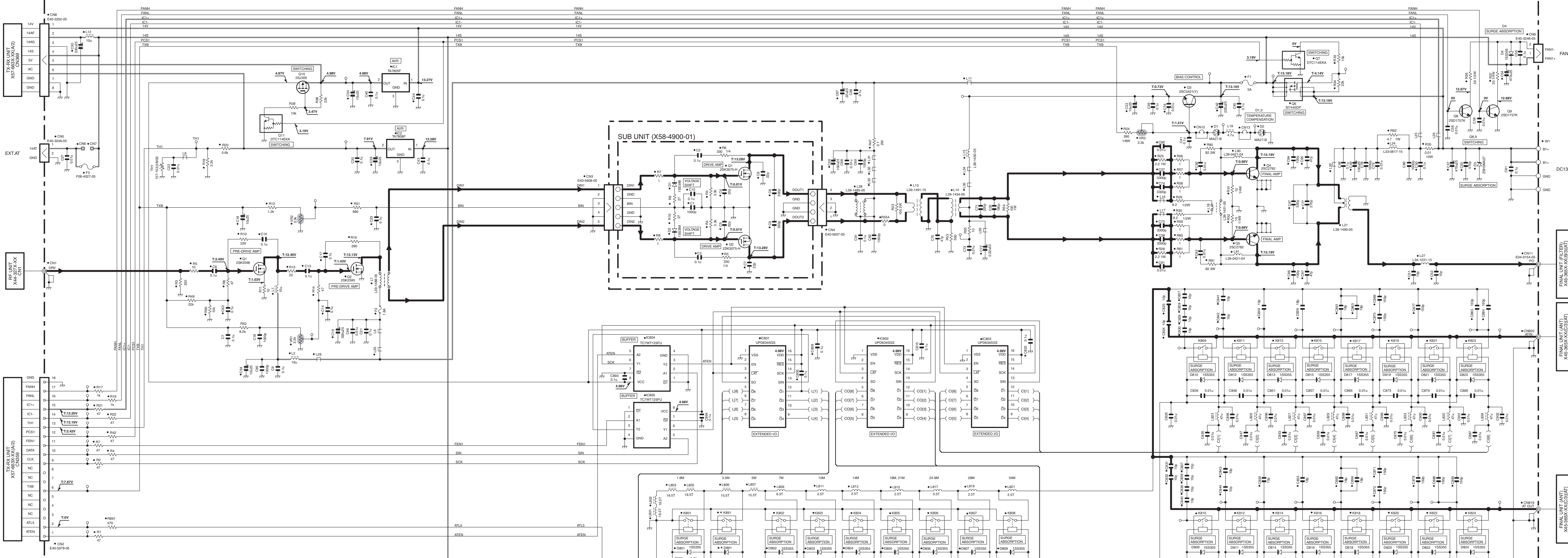


FINAL UNIT (X45-365X-XX) (A/3)





# FINAL UNIT (X45-365X-XX)(A/3)[AT]



X45-365X-XX(A/3)			D891	K891	Q891	L891	C891	C892
0-11	TS-480SAT	K	1SS355	S76-0415-05	DTC114EKA	47u	0.01u	0.01u
2-71	TS-480SAT	E	NO	NO	NO	NO	NO	NO

DC13.8V

FINAL UNIT (A/3)  
X45-365X-XX(B/3)[AT]  
CN102

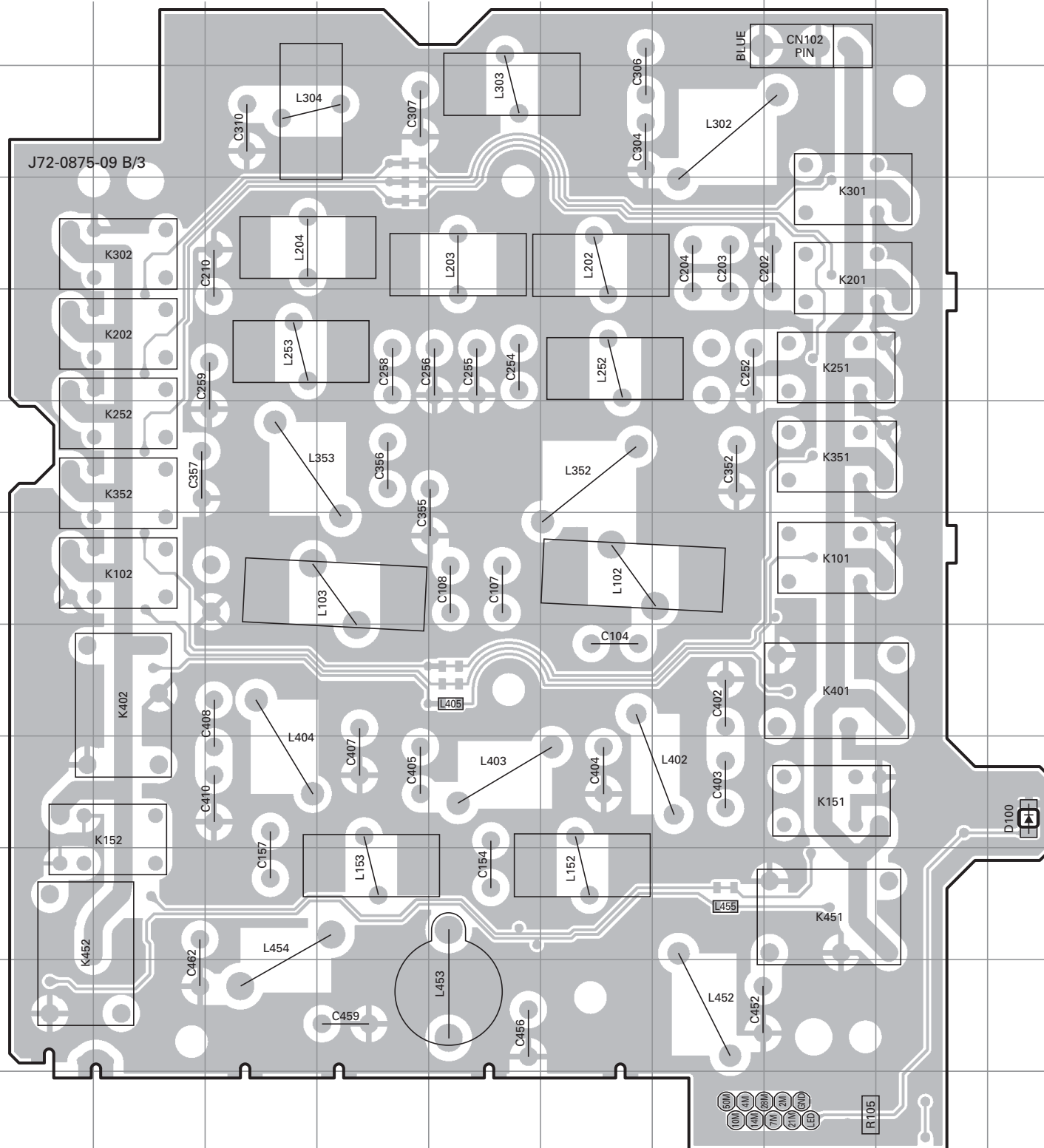
FINAL UNIT (A/3)  
X45-365X-XX(C/3)[AT]  
CN504

FINAL UNIT (A/3)  
X45-365X-XX(C/3)[AT]  
CN505



# TS-480HX/480SAT PC BOARD

100W FINAL UNIT (X45-365X-XX) (B/3) 0-11 : KS 2-71 : ES  
Component side view (J72-0875-09)



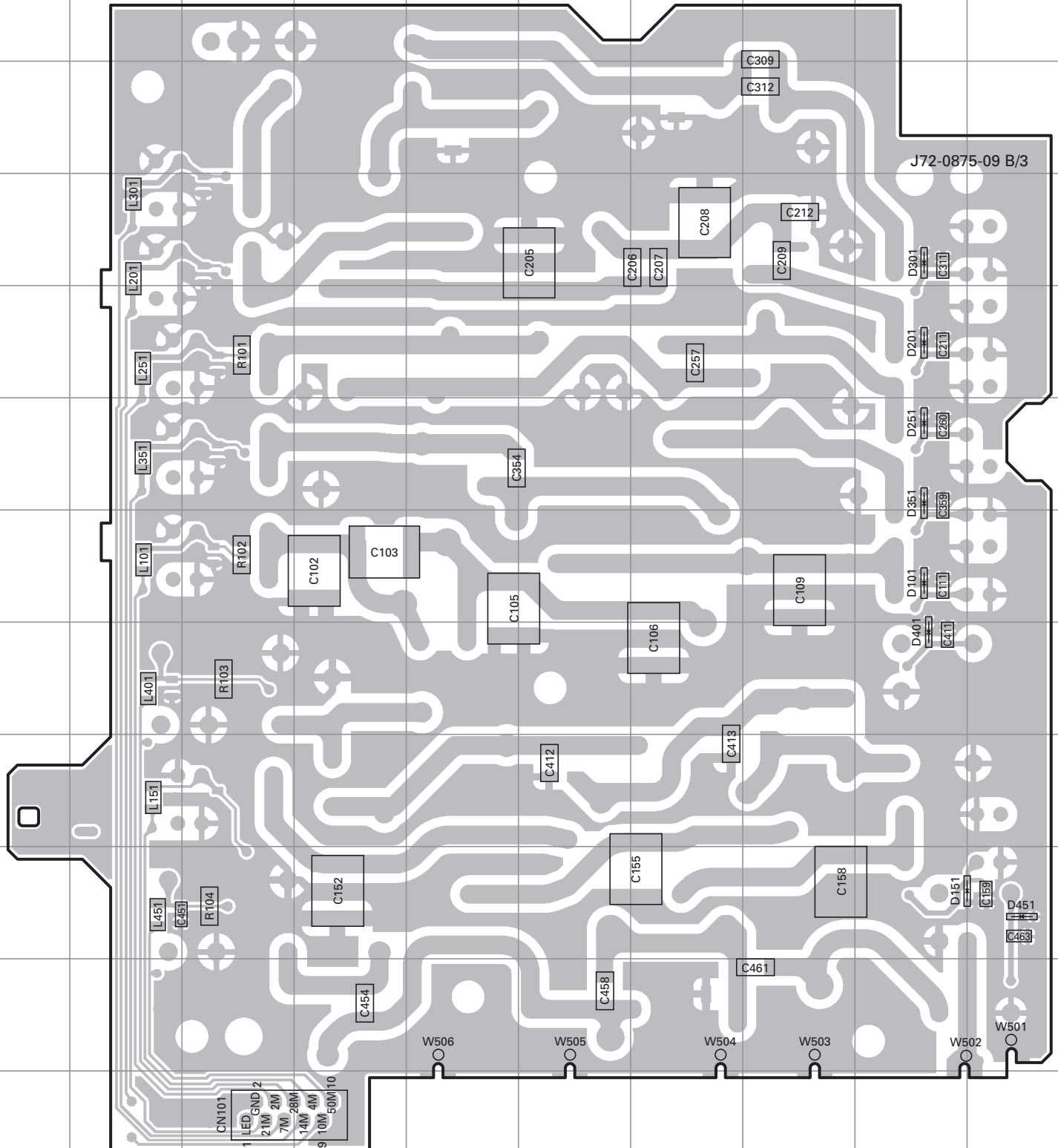
Ref No.	Address
D100	9J

Component side  
Layer 1  
Layer 2  
Foil side

# TS-480HX/480SAT

**100W FINAL UNIT (X45-365X-XX) (B/3) 0-11 : KS 2-71 : ES**

**Foil side view (J72-0875-09)**



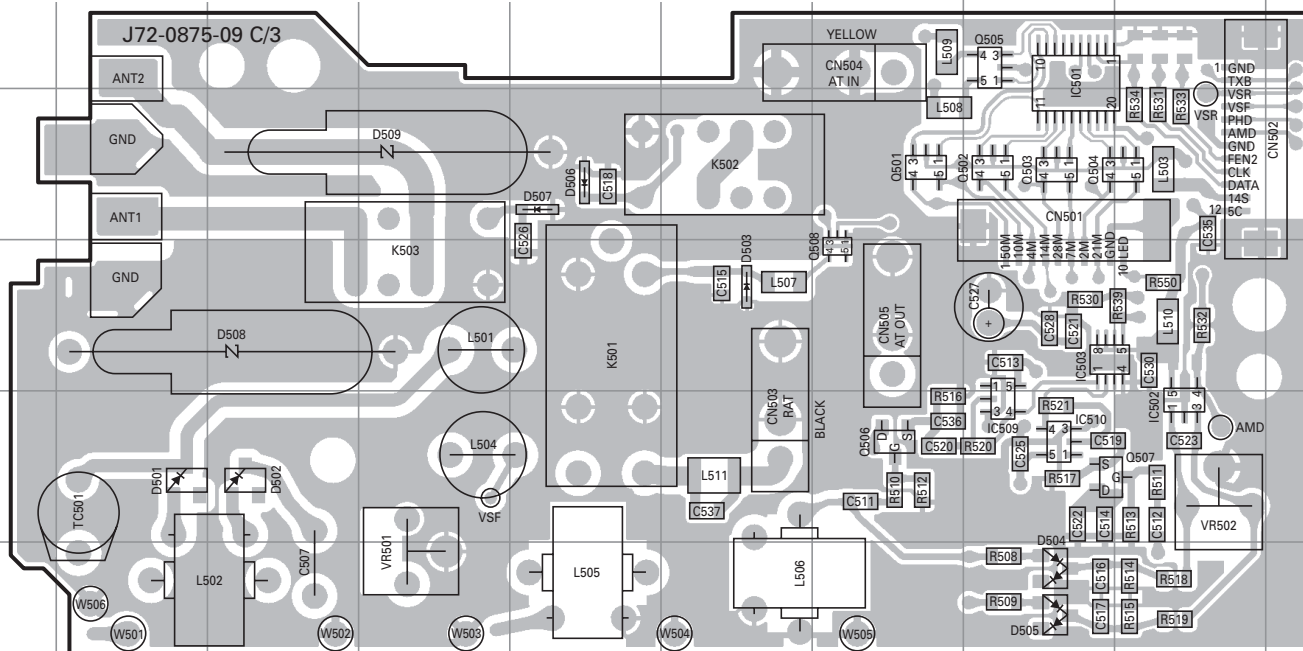
Ref No.	Address	Ref No.	Address
D101	7I	D301	4I
D151	10I	D351	6I
D201	5I	D401	8I
D251	6I	D451	10J

Diagram illustrating the component side and foil side of a two-layer structure:

- Component side** (top)
- Layer 1** (white)
- Layer 2** (gray)
- Foil side** (bottom)

# TS-480HX/480SAT PC BOARD

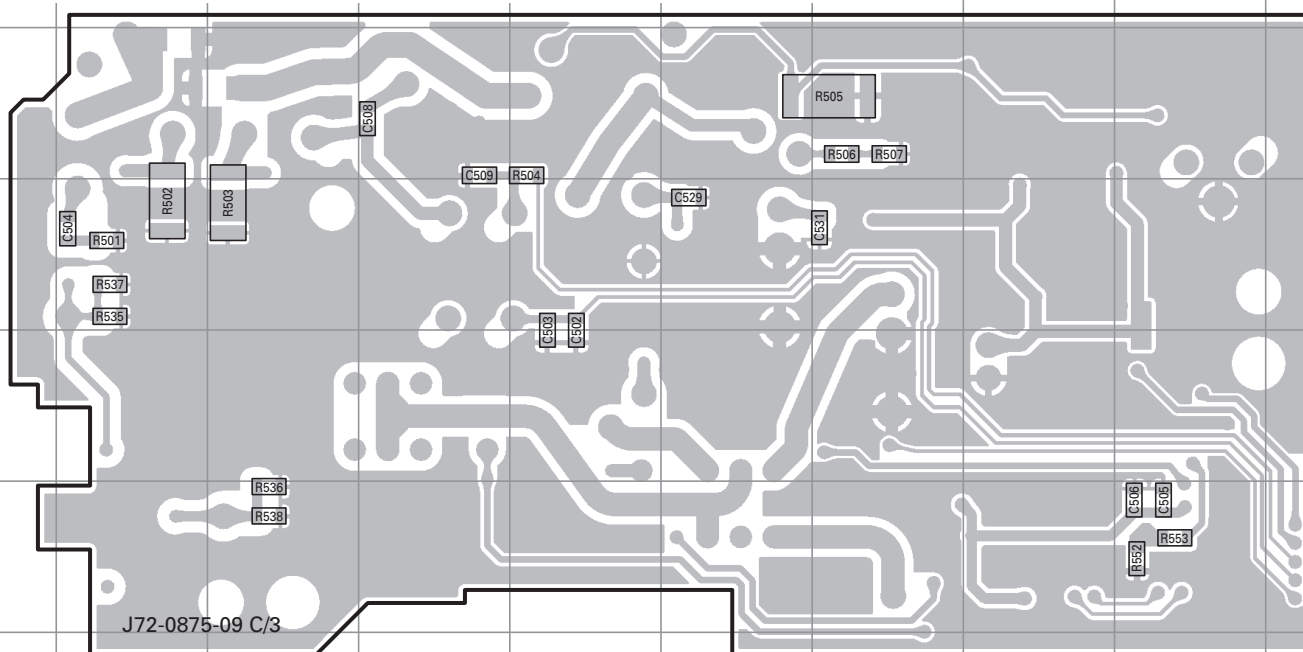
100W FINAL UNIT (X45-365X-XX) (C/3) 0-11 : KS 2-71 : ES  
Component side view (J72-0875-09)



Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address	Ref No.	Address
IC501	2H	IC510	5H	Q504	3I	Q508	4G	D504	6H	D508	4C
IC502	5I	Q501	3G	Q505	2H	D501	5B	D505	6H	D509	3D
IC503	4H	Q502	3H	Q506	5G	D502	5C	D506	3E		
IC509	5H	Q503	3H	Q507	5H	D503	4F	D507	3E		

Component side  
Layer 1  
Layer 2  
Foil side

100W FINAL UNIT (X45-365X-XX) (C/3) 0-11 : KS 2-71 : ES  
Foil side view (J72-0875-09)

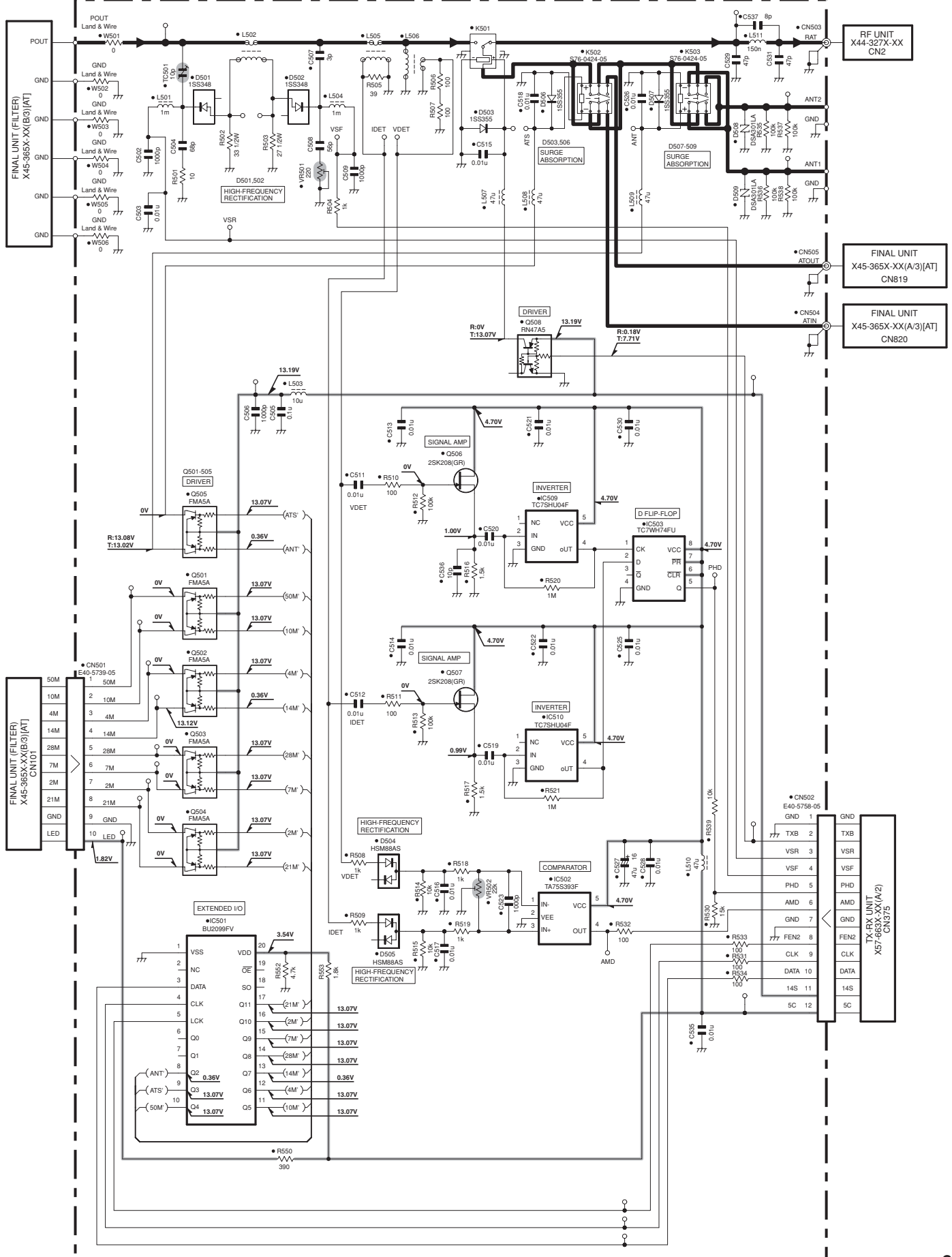


Component side  
Layer 1  
Layer 2  
Foil side

# SCHEMATIC DIAGRAM

# TS-480HX/480SAT

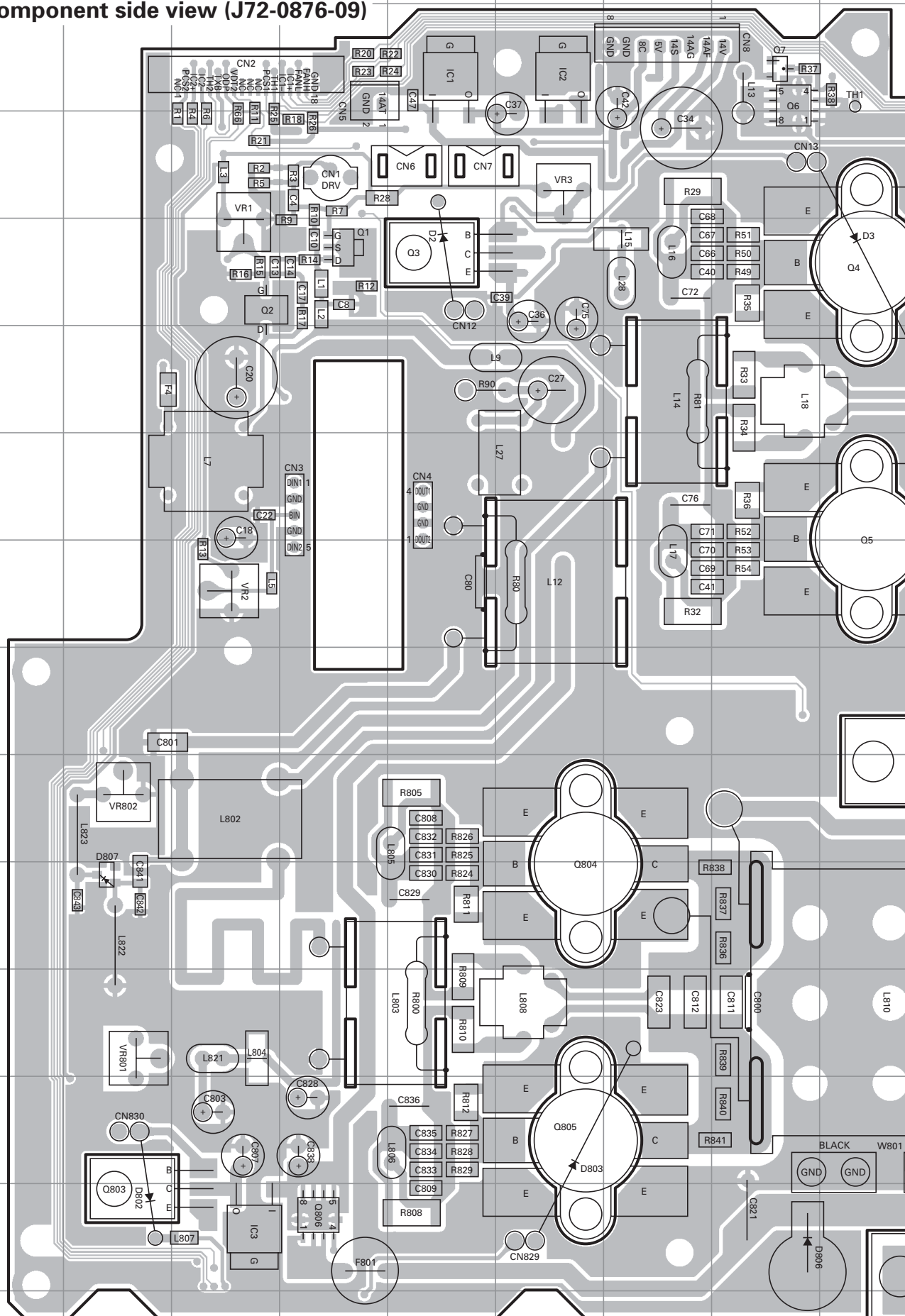
FINAL UNIT (ANT)(X45-365X-XX)(C/3)[AT] 0-11:TS-480SAT(K) 2-71:TS-480SAT(E)





# TS-480HX/480SAT PC BOARD

200W FINAL UNIT (X45-366X-XX) (A/3) 0-00 : KH 2-71 : EH  
Component side view (J72-0876-09)



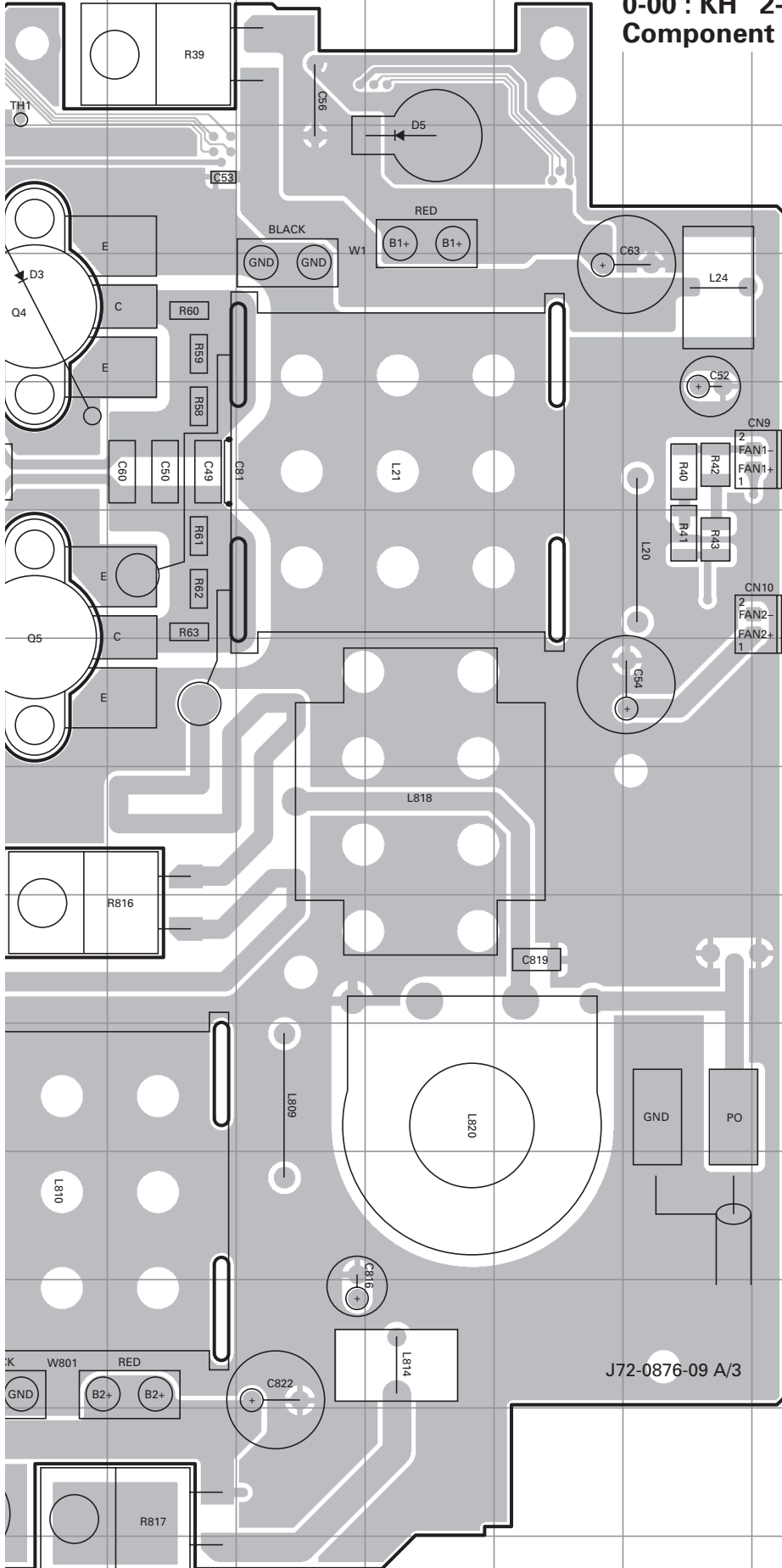


# PC BOARD TS-480HX/480SAT



200W FINAL UNIT (X45-366X-XX) (A/3)

0-00 : KH 2-71 : EH

Component side view (J72-0876-09)



Ref. No.	Address
IC1	2F
IC2	2G
IC3	13D
Q1	4E
Q2	4D
Q3	4F
Q4	4J
Q5	6J
Q6	2I
Q7	2I
Q803	13C
Q804	9G
Q805	12G
Q806	13E
D2	4F
D3	4J
D5	3M
D802	13C
D803	12G
D806	13I
D807	10C

Component side  
 Layer 1   
 Layer 2   
 Foil side

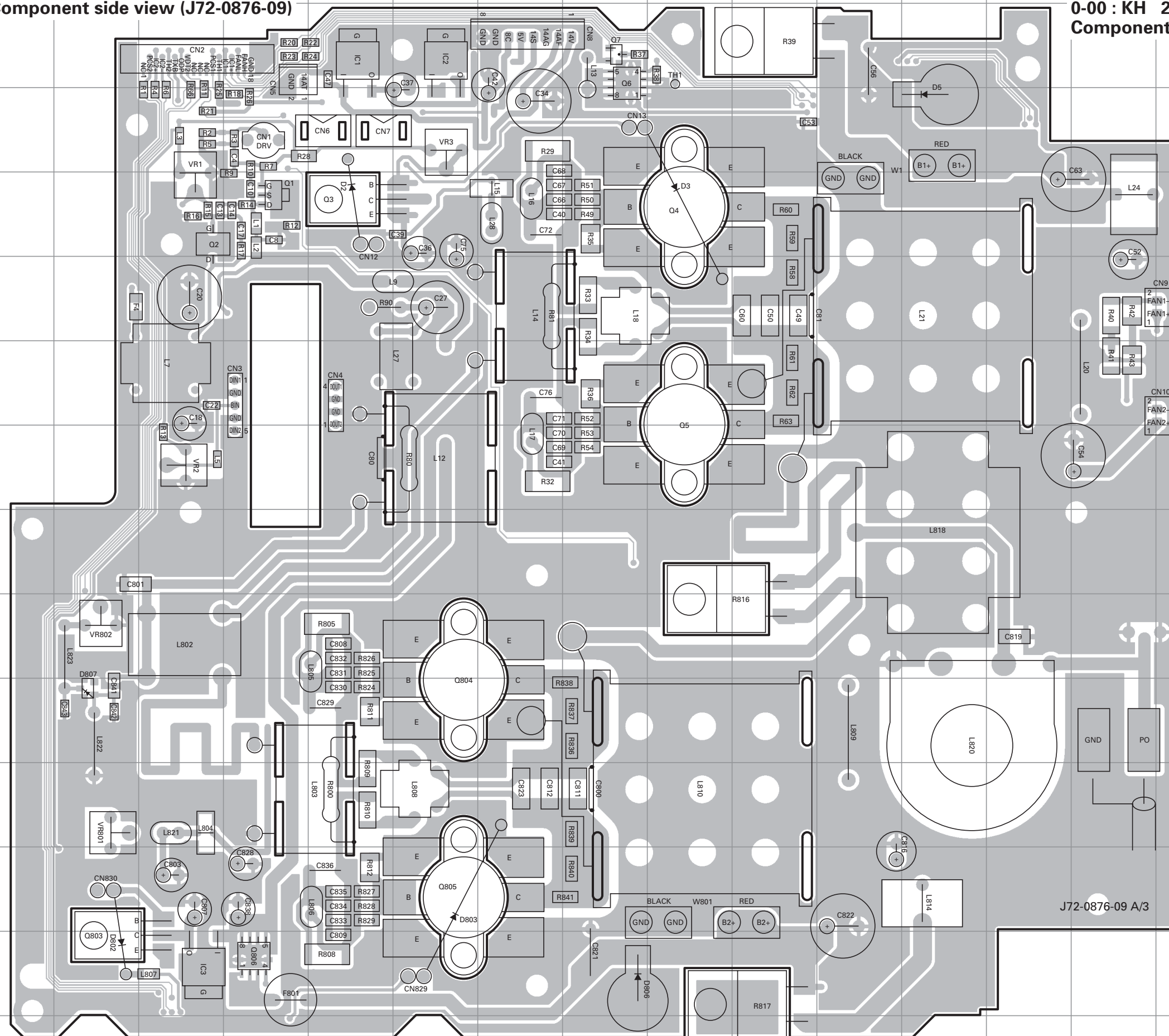
# TS-480HX/480SAT PC BOARD

200W FINAL UNIT (X45-366X-XX) (A/3) 0-00 : KH 2-71 : EH  
Component side view (J72-0876-09)

# PC BOARD TS-480HX/480SAT

200W FINAL UNIT (X45-366X-XX) (A/3)  
0-00 : KH 2-71 : EH  
Component side view (J72-0876-09)

Ref. No.	Address
IC1	2F
IC2	2G
IC3	13D
Q1	4E
Q2	4D
Q3	4F
Q4	4J
Q5	6J
Q6	2I
Q7	2I
Q803	13C
Q804	9G
Q805	12G
Q806	13E
D2	4F
D3	4J
D5	3M
D802	13C
D803	12G
D806	13I
D807	10C



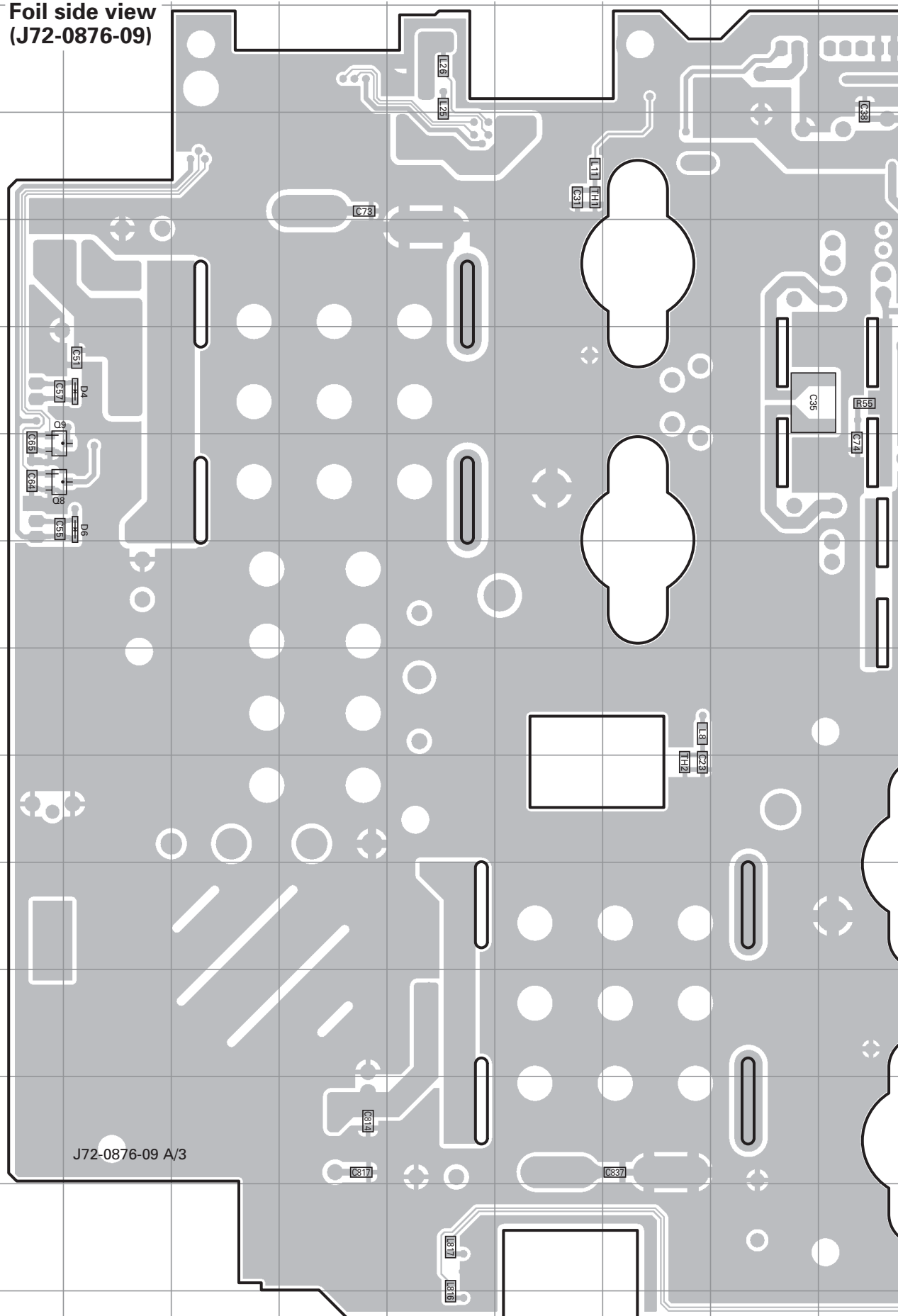
J72-0876-09 A/3

Component side  
Layer 1  
Layer 2  
Foil side

# TS-480HX/480SAT PC BOARD

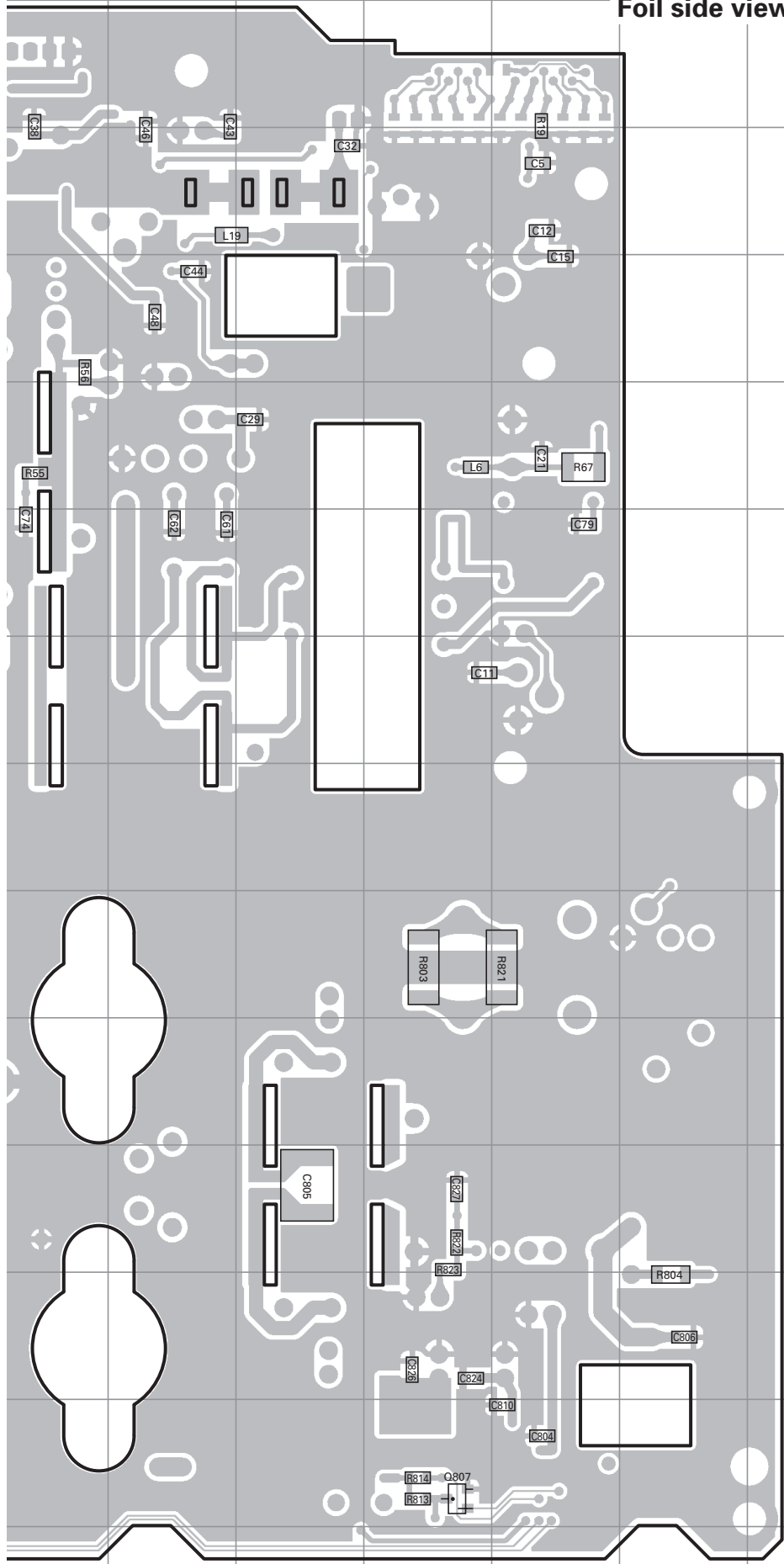
200W FINAL UNIT (X45-366X-XX) (A/3) 0-00 : KH 2-71 : EH

Foil side view  
(J72-0876-09)

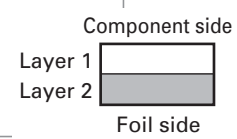


# PC BOARD TS-480HX/480SAT

200W FINAL UNIT (X45-366X-XX) (A/3) 0-00 : KH 2-71 : EH  
Foil side view (J72-0876-09)



Ref. No.	Address
Q8	6B
Q9	6B
Q807	13M
D4	5C
D6	6C

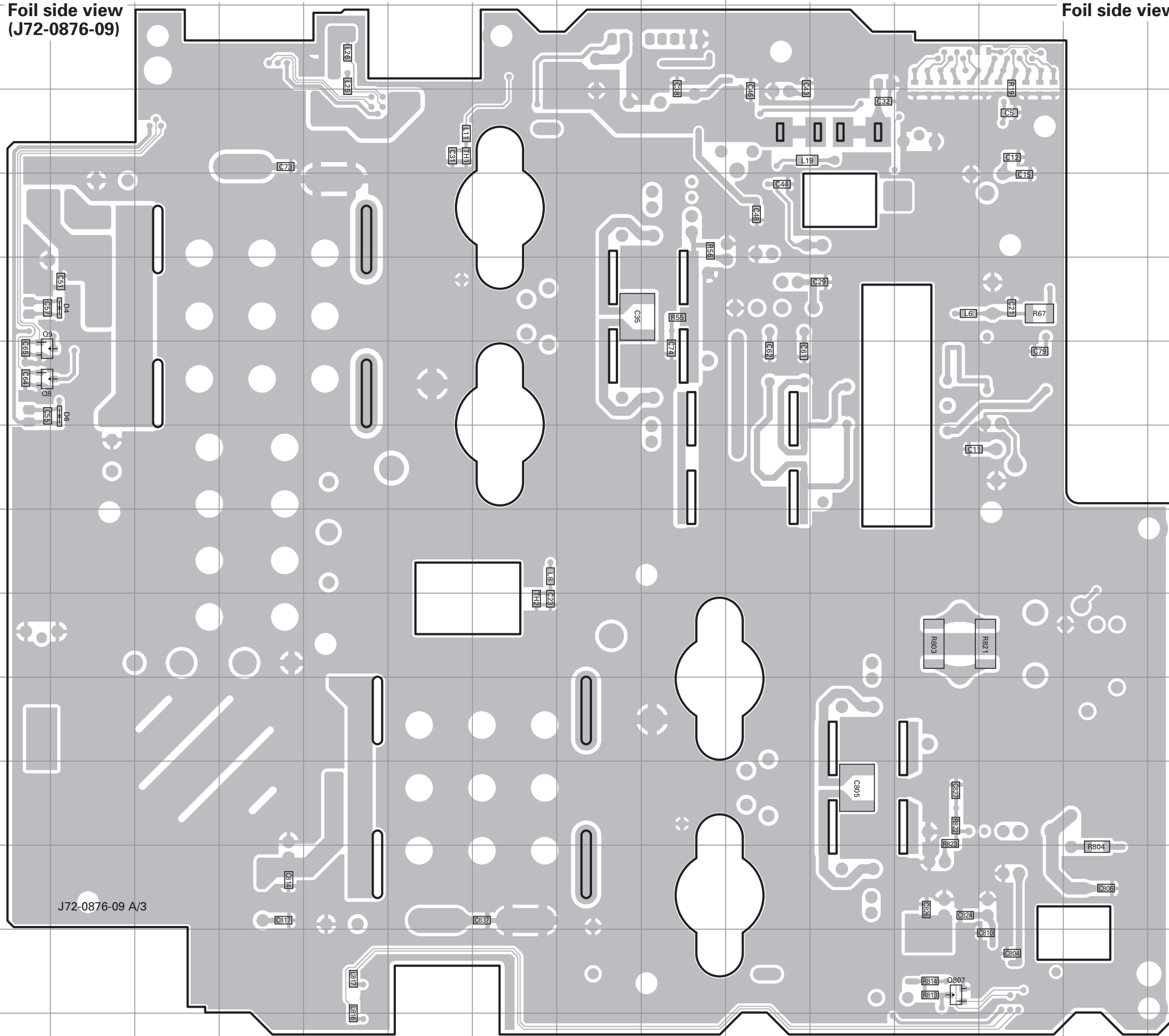


TS-480HX/480SAT PC BOARD

200W FINAL UNIT (X45-366X-XX) (A/3) 0-00 : KH 2-71 : EH  
Foil side view (J72-0876-09)

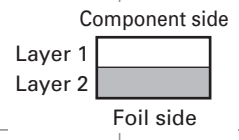
PC BOARD TS-480HX/480SAT

200W FINAL UNIT (X45-366X-XX) (A/3) 0-00 : KH 2-71 : EH  
Foil side view (J72-0876-09)



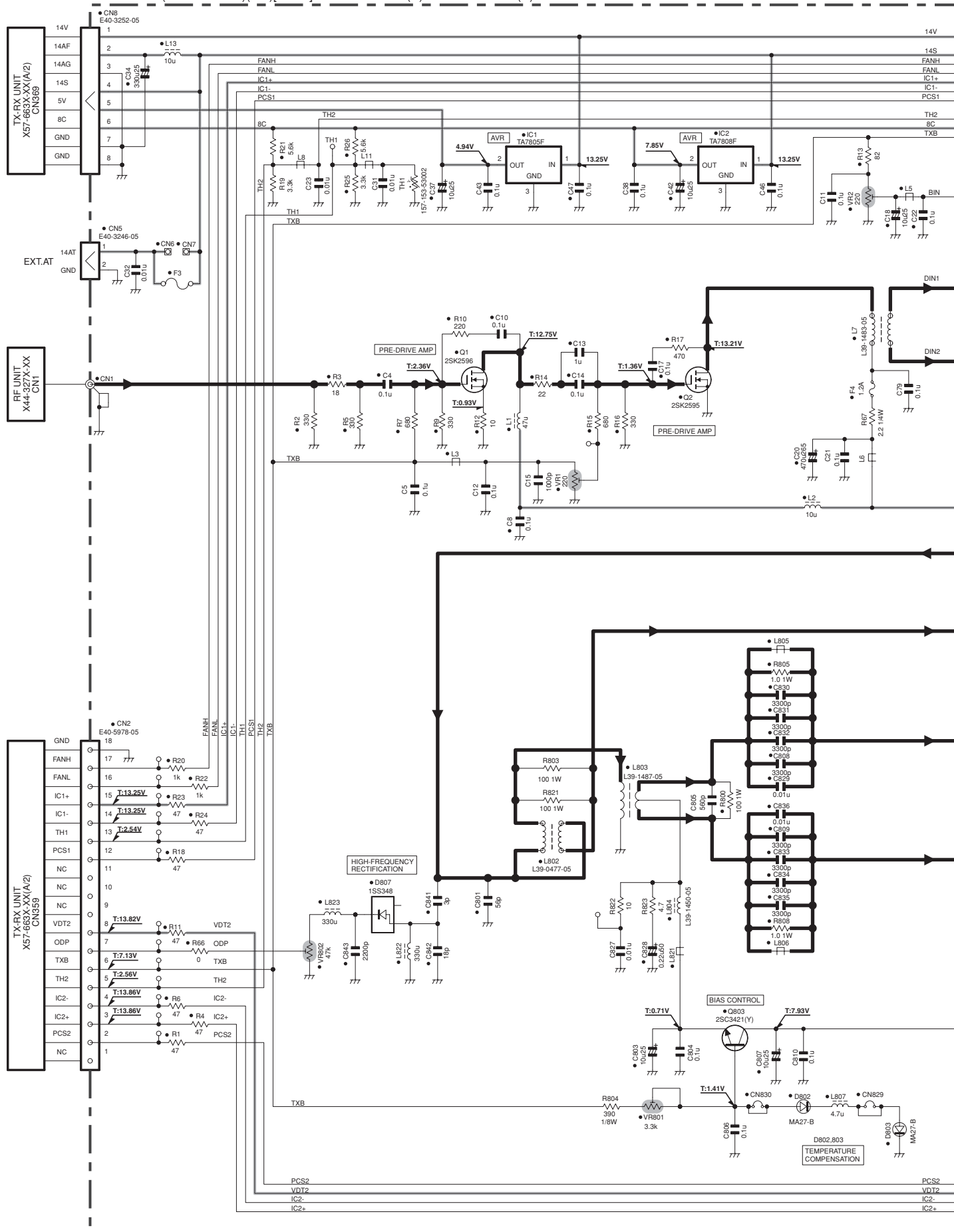
Ref. No.	Address
Q8	6B
Q9	6B
Q807	13M
D4	5C
D6	6C

J72-0876-09 A/3



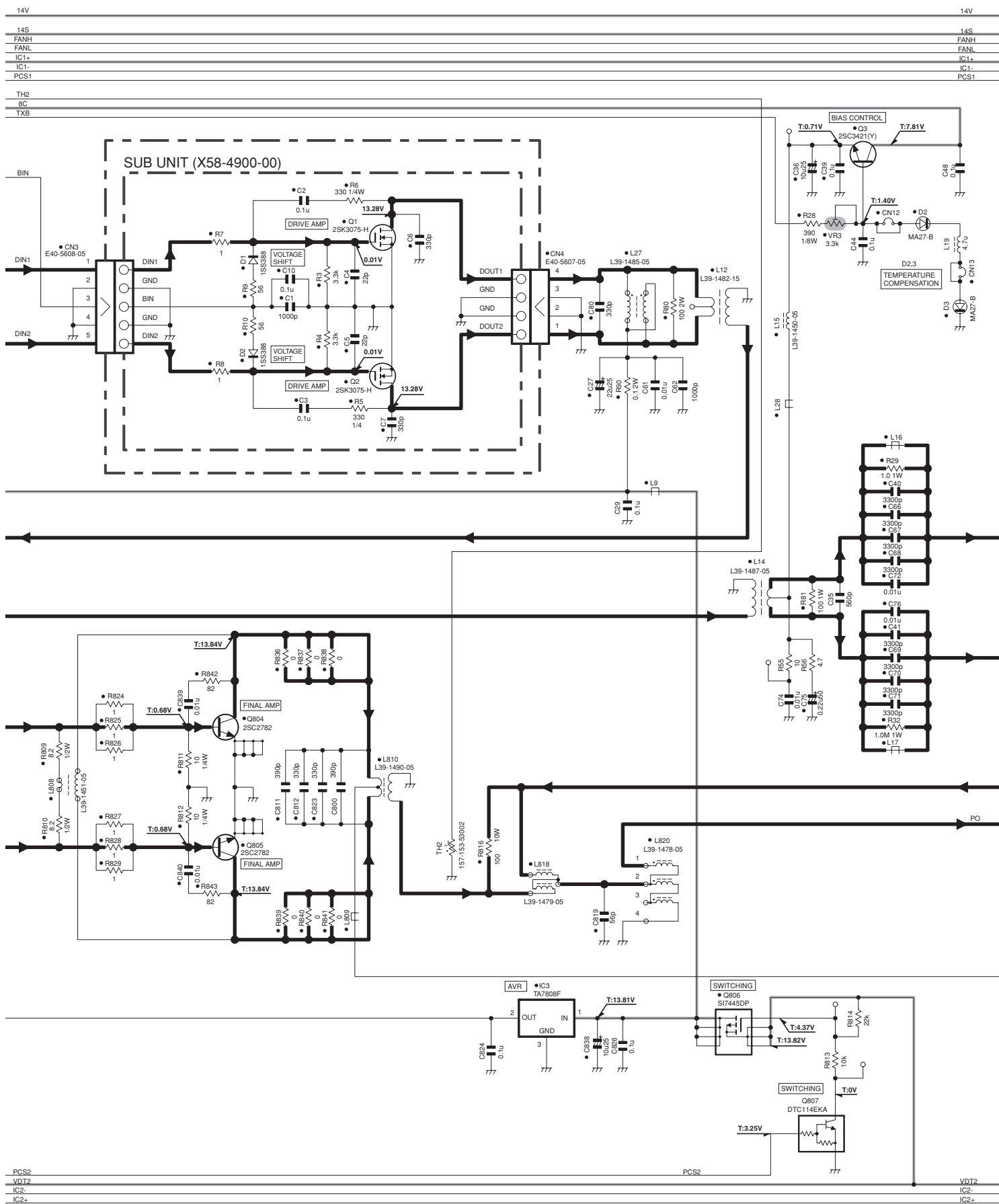
# TS-480HX/480SAT SCHEMATIC DIAGRAM

FINAL UNIT (X45-366X-XX)(A/3)[200W] 0-00:TS-480HX(K) 2-71:TS-480HX(E)



# SCHEMATIC DIAGRAM TS-480HX/480SAT

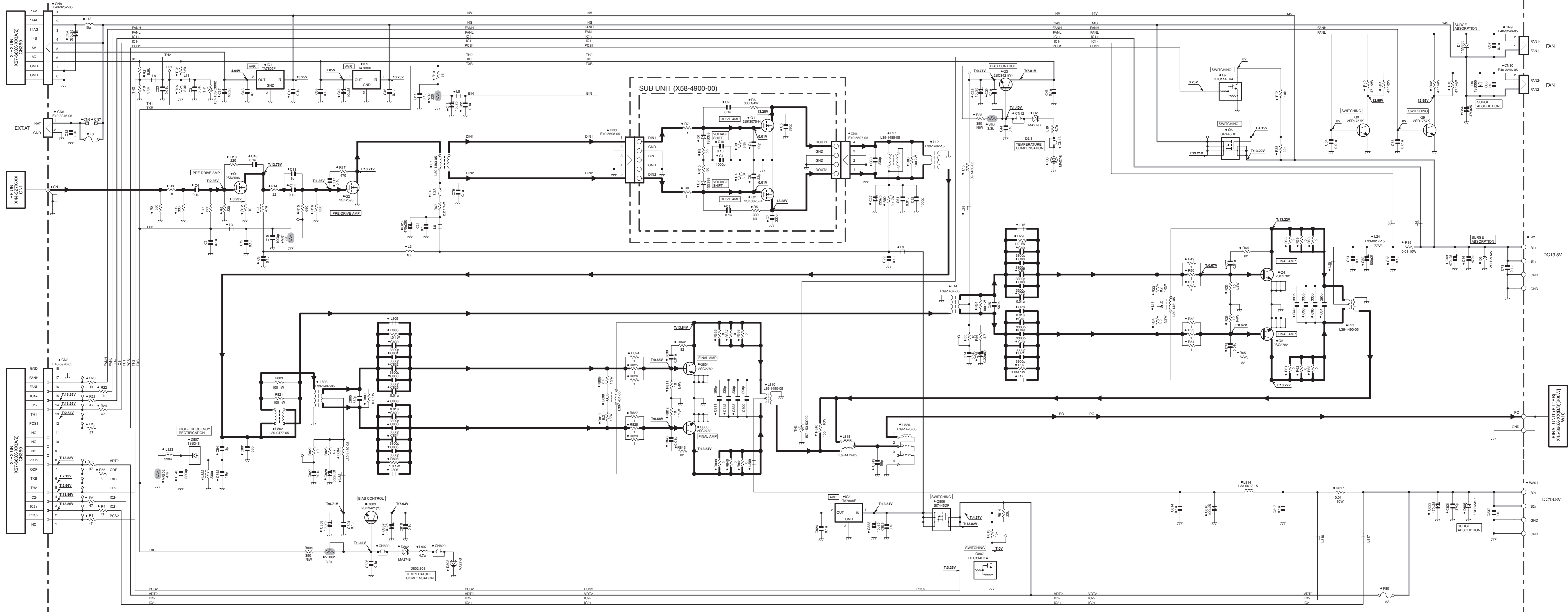
FINAL UNIT (X45-366X-XX) (A/3)





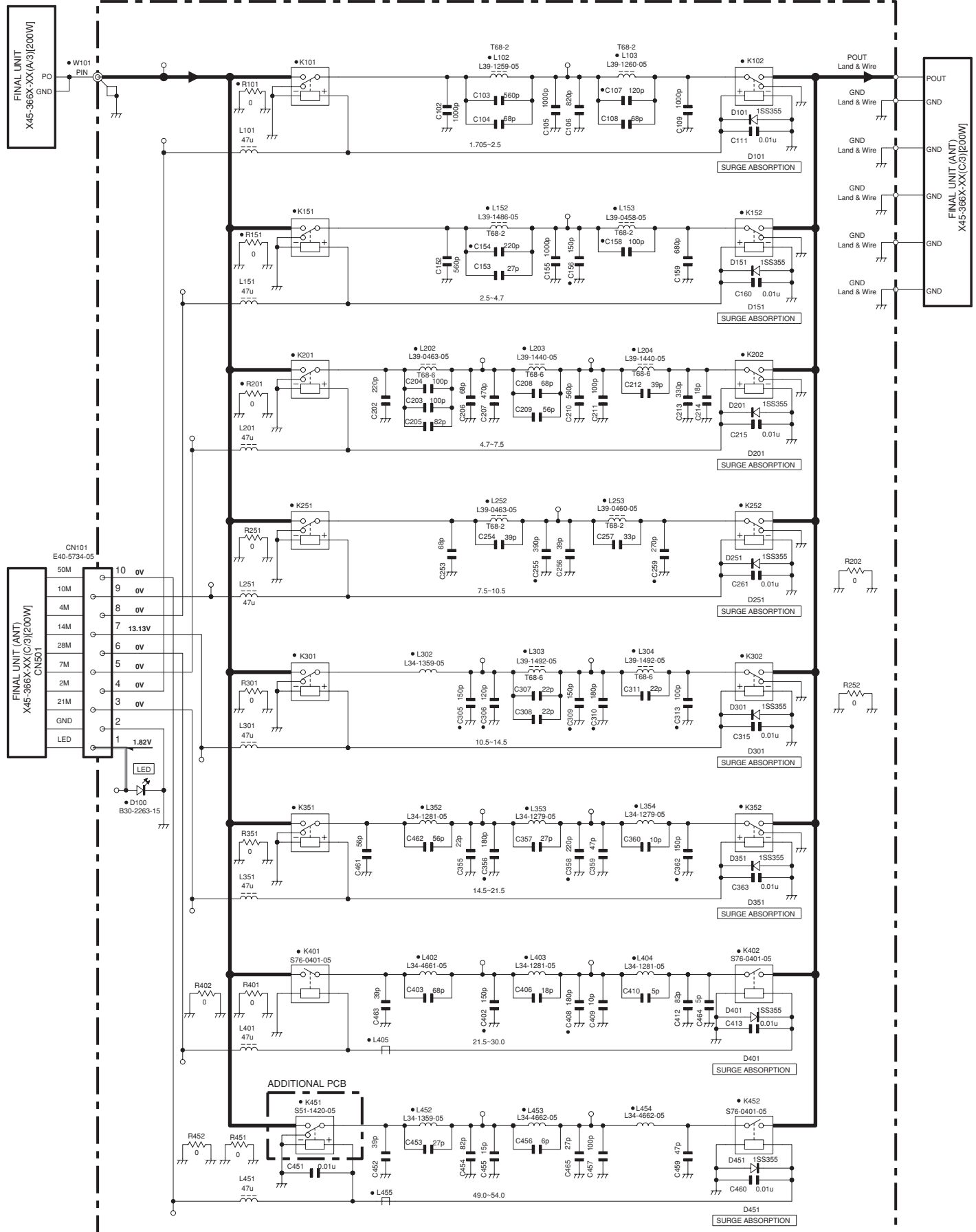


FINAL UNIT (X45-366X-XX)(A/3)[200W] 0-00:TS-480HX(K) 2-71:TS-480HX(E)



# SCHEMATIC DIAGRAM TS-480HX/480SAT

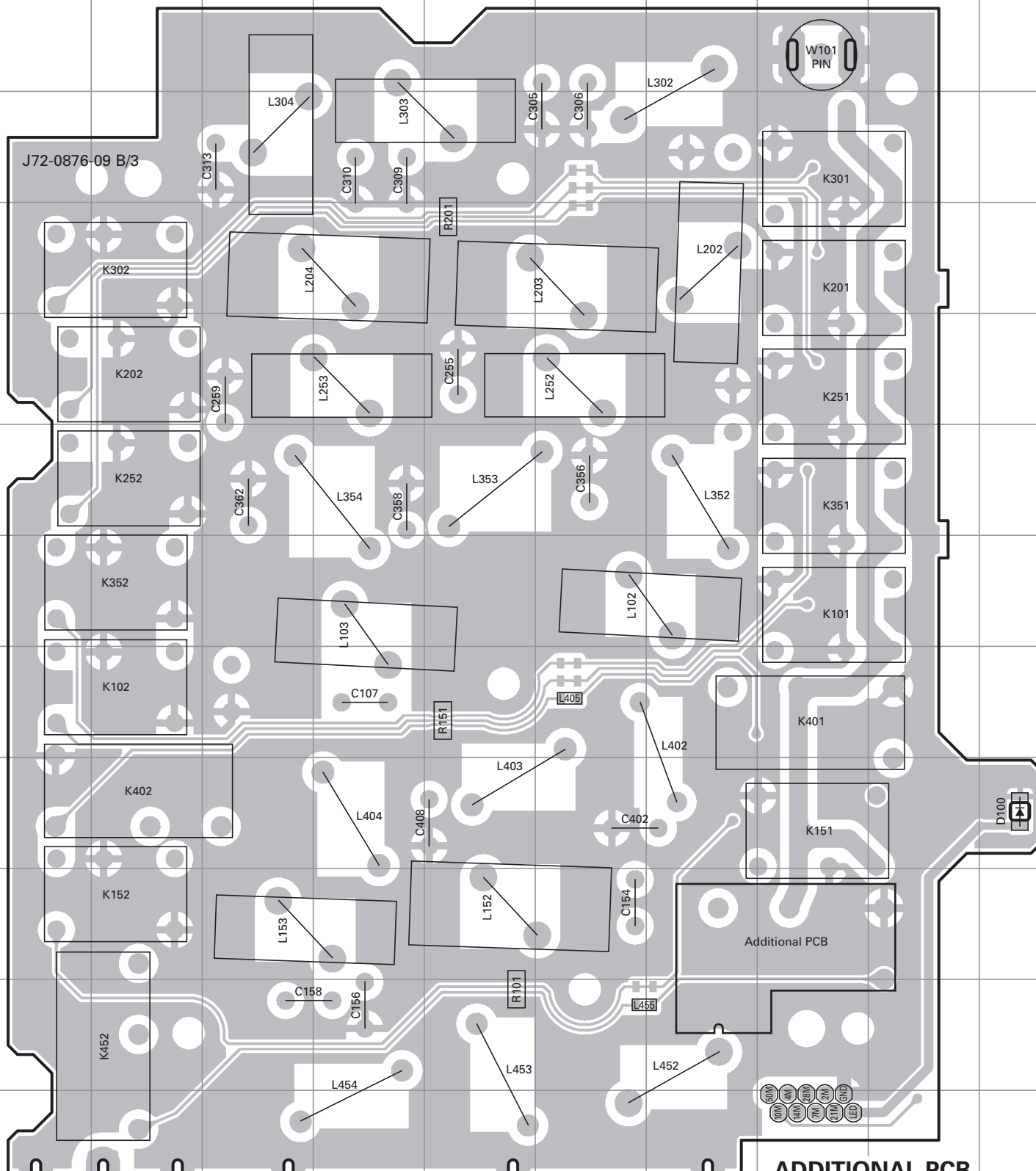
FINAL UNIT (FILTER) (X45-366X-XX)(B/3) [200W] 0-00:TS-480HX(K) 2-71:TS-480HX(E)



# TS-480HX/480SAT PC BOARD

200W FINAL UNIT (X45-366X-XX) (B/3) 0-00 : KH 2-71 : EH

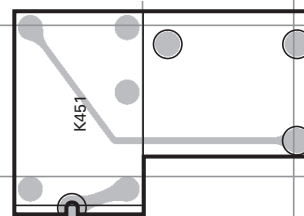
Component side view (J72-0876-09)



Component side  
Layer 1  
Layer 2  
Foil side

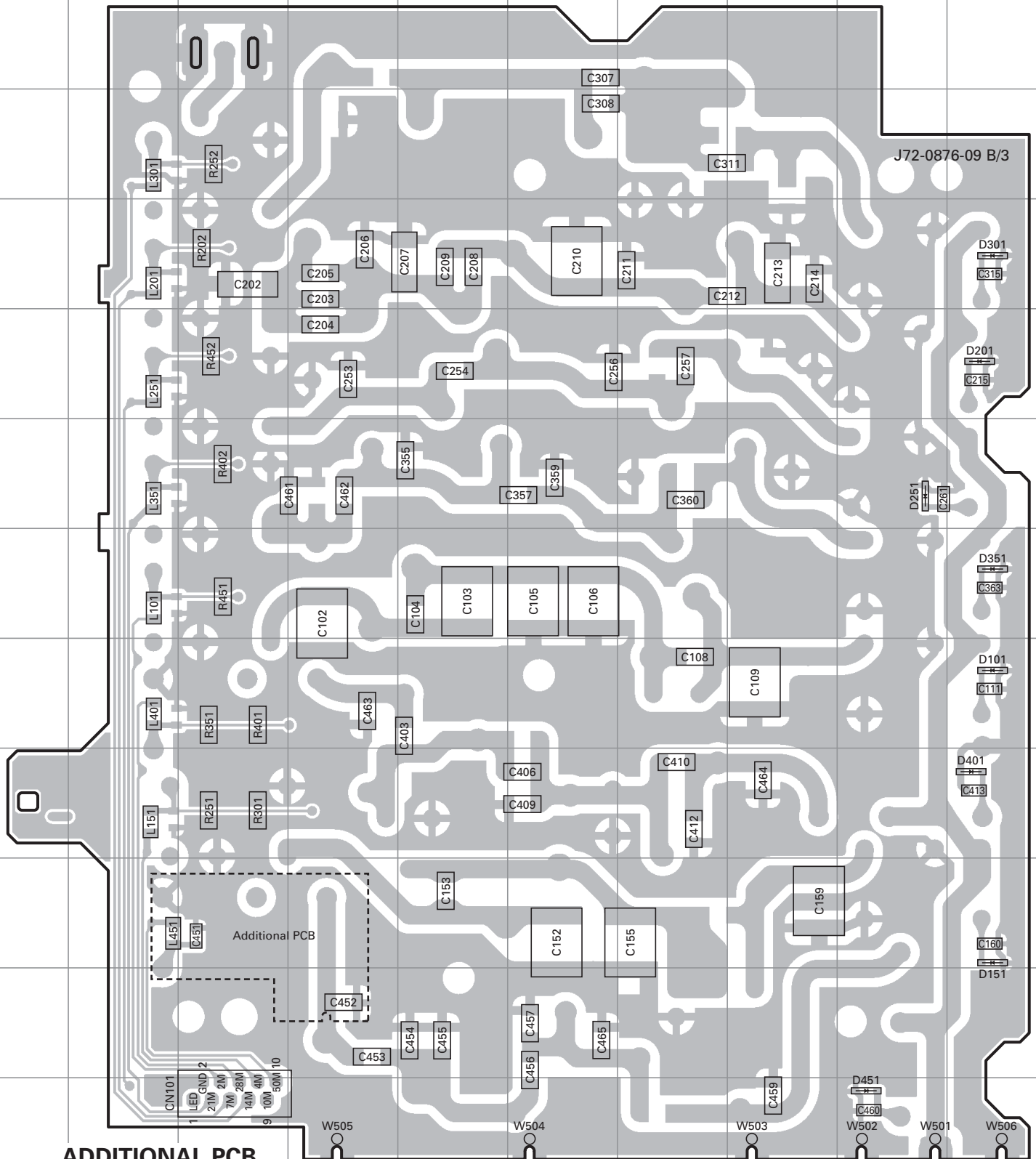
Ref No.	Address
D100	9J

ADDITIONAL PCB

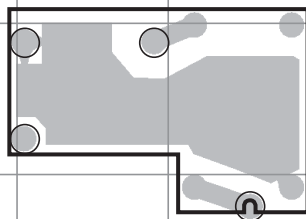


# PC BOARD TS-480HX/480SAT

200W FINAL UNIT (X45-366X-XX) (B/3) 0-00 : KH 2-71 : EH  
Foil side view (J72-0876-09)



## ADDITIONAL PCB

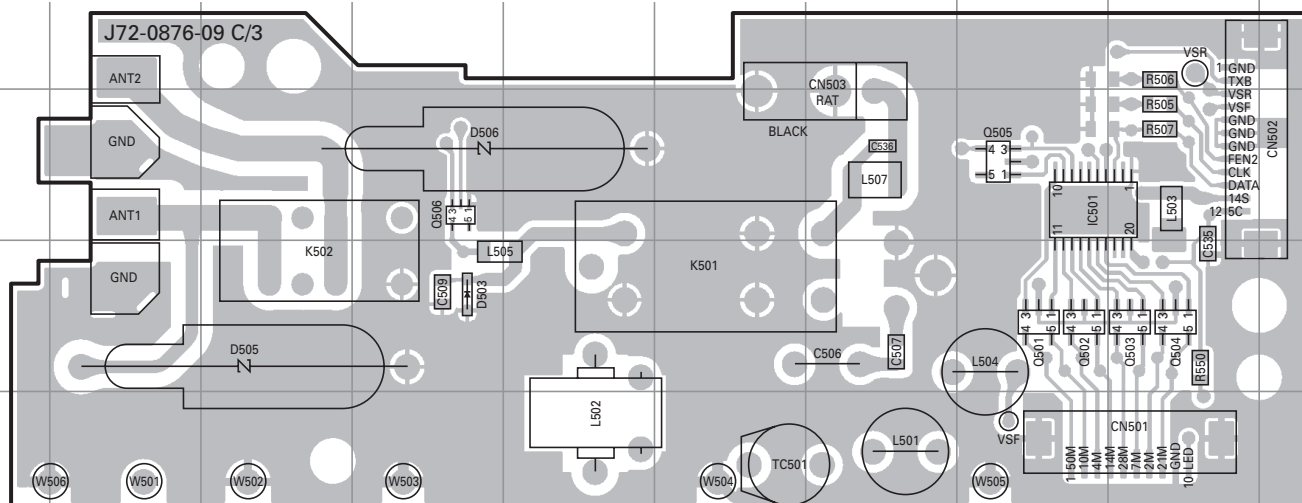


Ref No.	Address	Ref No.	Address
D101	8J	D301	4J
D151	10J	D351	7J
D201	5J	D401	9J
D251	6I	D451	12I

Component side  
Layer 1  
Layer 2  
Foil side

# TS-480HX/480SAT PC BOARD

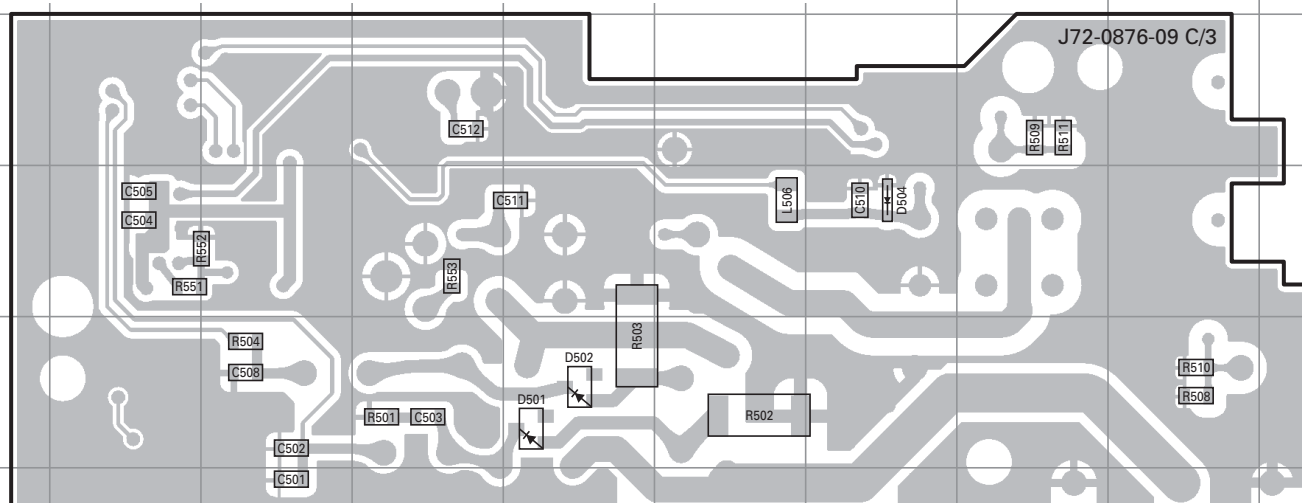
200W FINAL UNIT (X45-366X-XX) (C/3) 0-00 : KH 2-71 : EH  
Component side view (J72-0876-09)



Ref No.	Address	Ref No.	Address	Ref No.	Address
IC501	3H	Q504	4I	D505	4C
Q501	4H	Q505	3H	D506	3D
Q502	4H	Q506	3D		
Q503	4I	D503	4D		

Component side  
Layer 1  
Layer 2  
Foil side

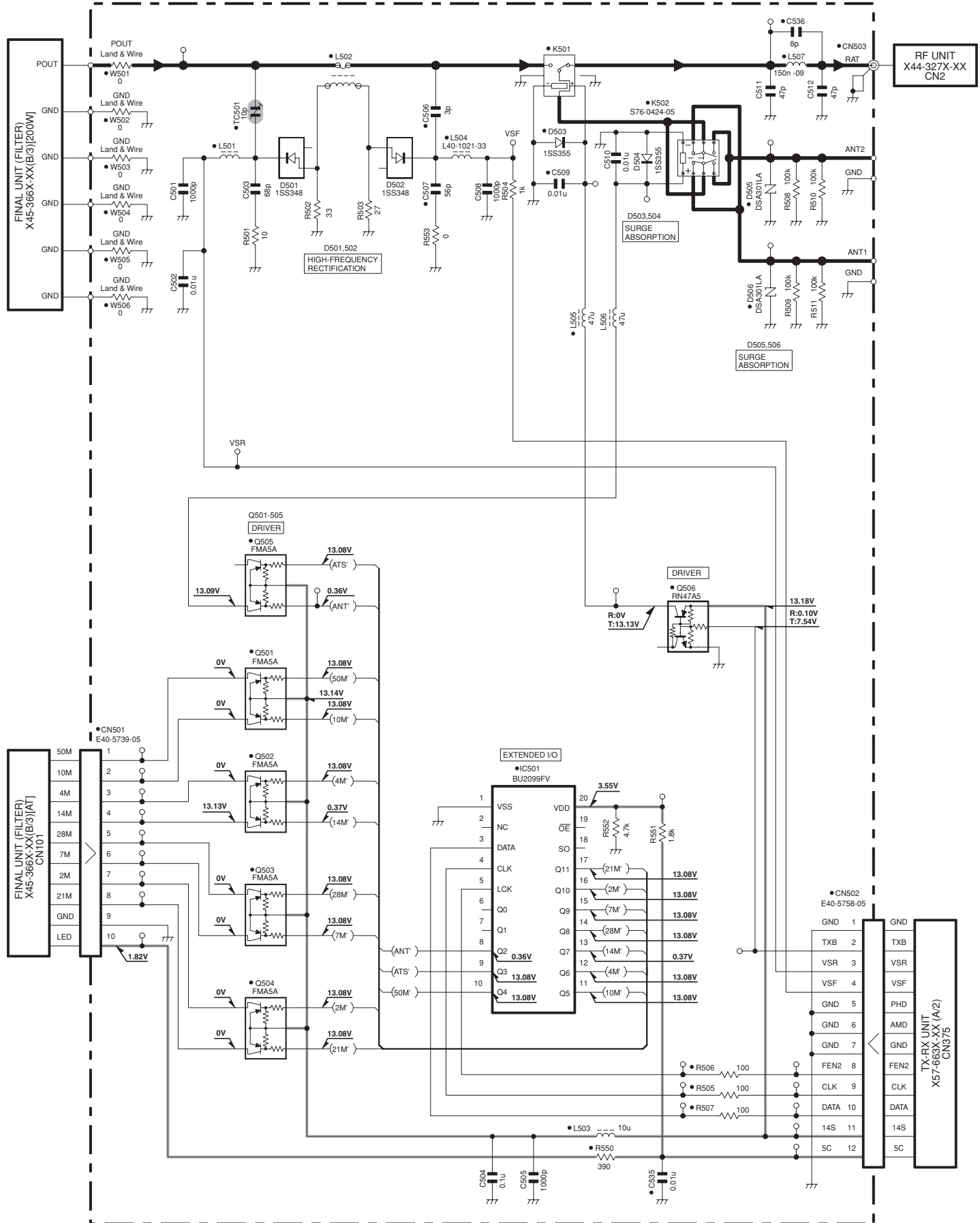
200W FINAL UNIT (X45-366X-XX) (C/3) 0-00 : KH 2-71 : EH  
Foil side view (J72-0876-09)



Ref No.	Address
D501	11E
D502	11E
D504	10G

Component side  
Layer 1  
Layer 2  
Foil side

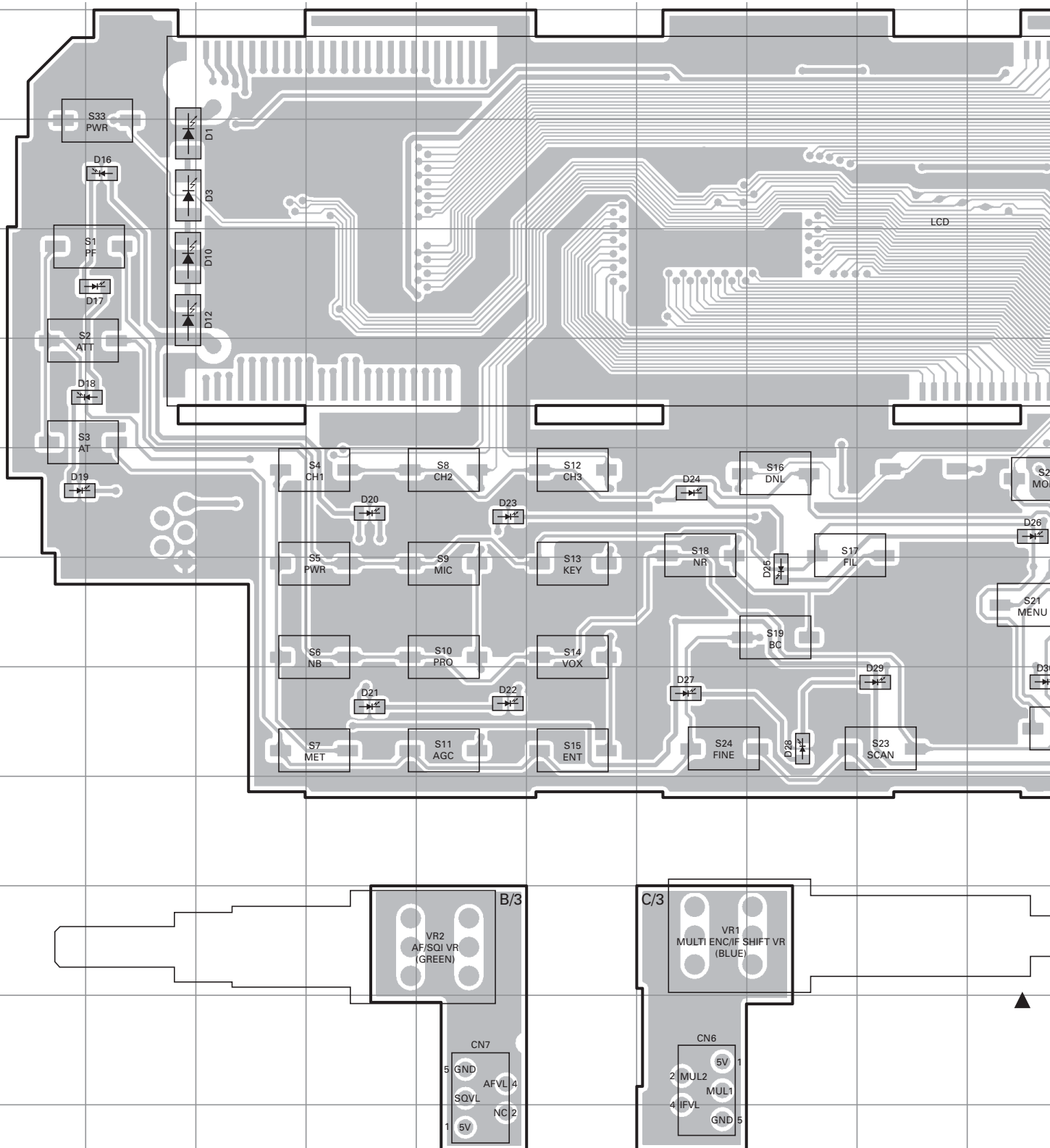
FINAL UNIT (ANT)(X45-366X-XX)(C/3)[200W] 0-00:TS-480HX(K) 2-71:TS-480HX(E)





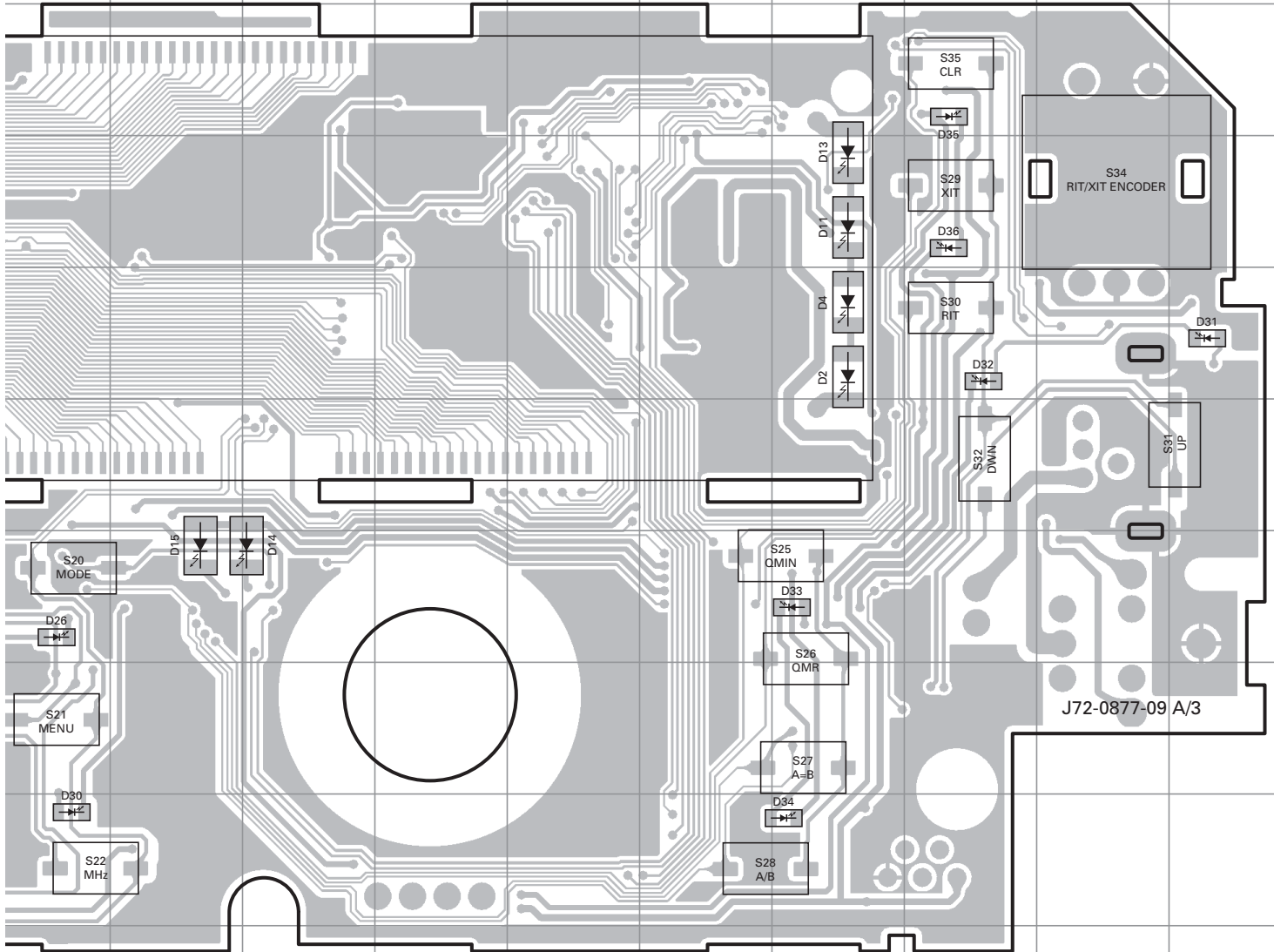
# TS-480HX/480SAT PC BOARD

DISPLAY UNIT (X54-3410-00) (A/3, B/3, C/3) Component side view (J72-0877-09)



# PC BOARD TS-480HX/480SAT

## DISPLAY UNIT (X54-3410-00) (A/3, B/3, C/3) Component side view (J72-0877-09)



Ref. No.	Address	Ref. No.	Address	Ref. No.	Address	Ref. No.	Address
D1	4B	D14	7L	D22	9E	D30	9J
D2	5P	D15	7K	D23	7E	D31	5S
D3	4B	D16	4B	D24	7G	D32	5Q
D4	5P	D17	5B	D25	8H	D33	7P
D10	5B	D18	6B	D26	7J	D34	9P
D11	4P	D19	7A	D27	9G	D35	3Q
D12	5B	D20	7D	D28	9H	D36	4Q
D13	4P	D21	9D	D29	9I		

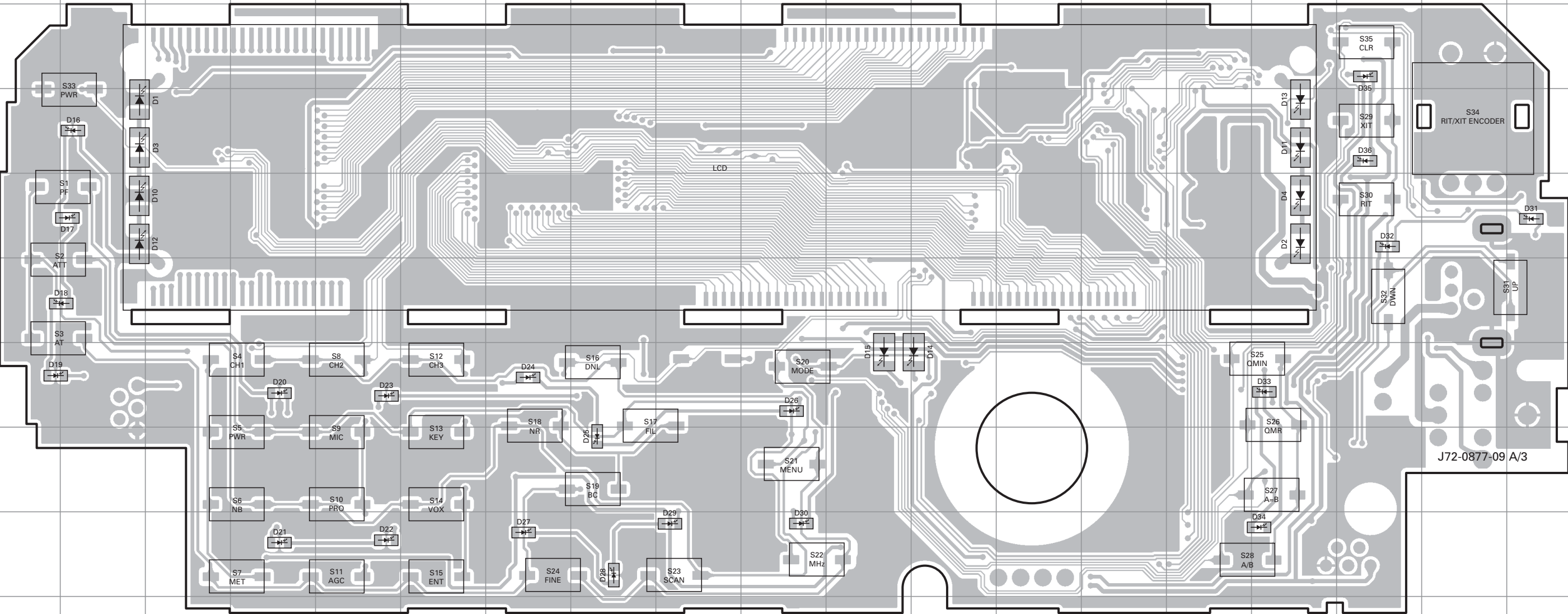
Component side  
 Layer 1   
 Layer 2   
 Foil side

TS-480HX/480SAT PC BOARD

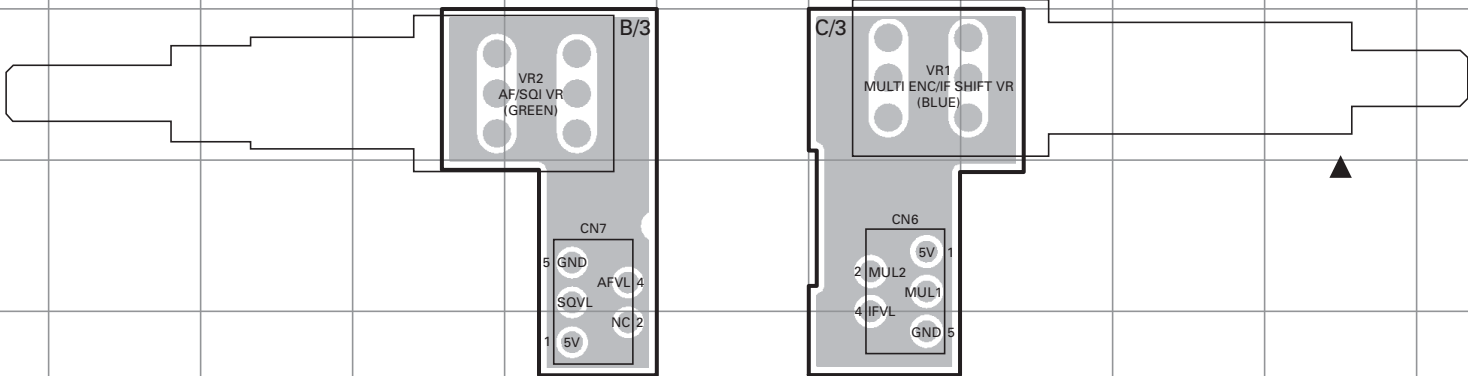
PC BOARD TS-480HX/480SAT

DISPLAY UNIT (X54-3410-00) (A/3, B/3, C/3) Component side view (J72-0877-09)

DISPLAY UNIT (X54-3410-00) (A/3, B/3, C/3) Component side view (J72-0877-09)



J72-0877-09 A/3

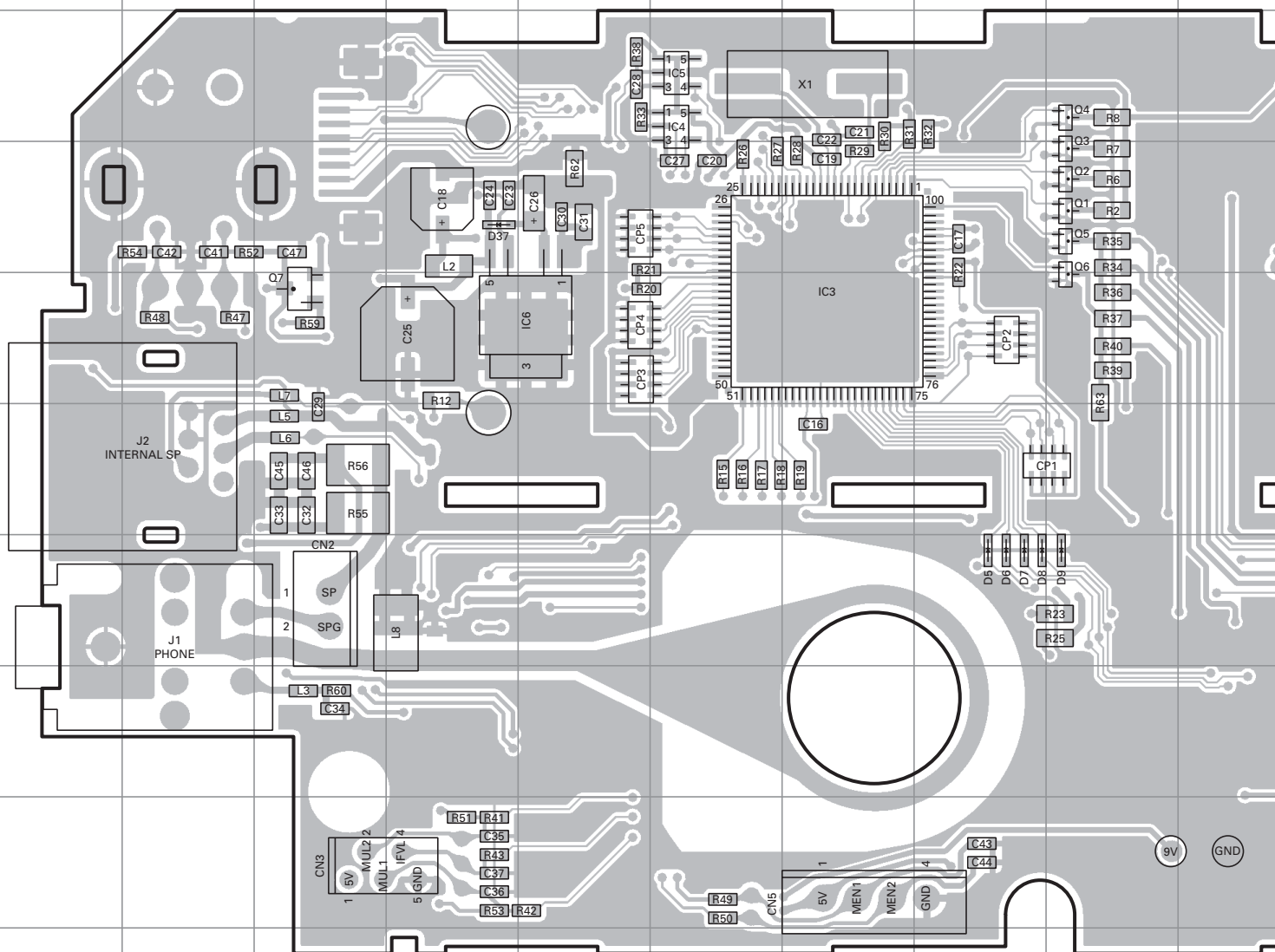


Ref. No.	Address	Ref. No.	Address	Ref. No.	Address	Ref. No.	Address
D1	4B	D14	7L	D22	9E	D30	9J
D2	5P	D15	7K	D23	7E	D31	5S
D3	4B	D16	4B	D24	7G	D32	5Q
D4	5P	D17	5B	D25	8H	D33	7P
D10	5B	D18	6B	D26	7J	D34	9P
D11	4P	D19	7A	D27	9G	D35	3Q
D12	5B	D20	7D	D28	9H	D36	4Q
D13	4P	D21	9D	D29	9I		

Component side  
Layer 1  
Layer 2  
Foil side

# TS-480HX/480SAT PC BOARD

DISPLAY UNIT (X54-3410-00) (A/3, B/3, C/3) Foil side view (J72-0877-09)

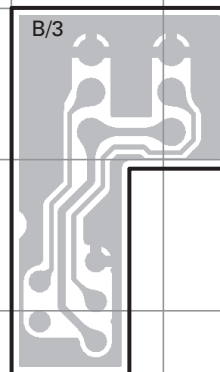
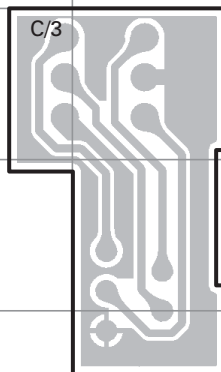
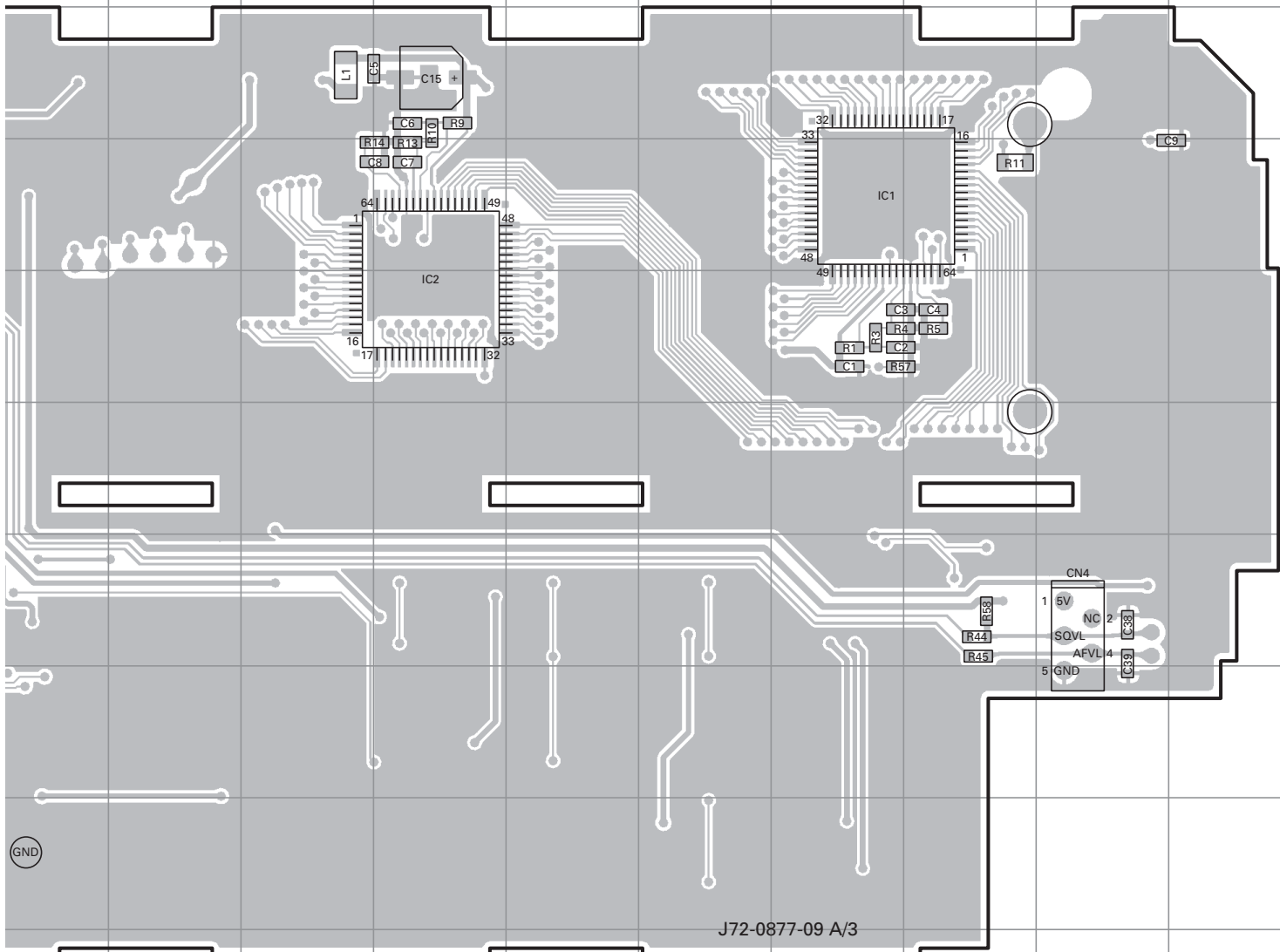


Component side  
Layer 1  
Layer 2  
Foil side

Ref. No.	Address	Ref. No.	Address	Ref. No.	Address
IC1	4P	Q2	4I	D6	7H
IC2	5M	Q3	4I	D7	7H
IC3	5G	Q4	3I	D8	7H
IC4	3F	Q5	4I	D9	7I
IC5	3F	Q6	5I	D37	4D
IC6	5E	Q7	5C		
Q1	4I	D5	7H		

# PC BOARD TS-480HX/480SAT

DISPLAY UNIT (X54-3410-00) (A/3, B/3, C/3) Foil side view (J72-0877-09)

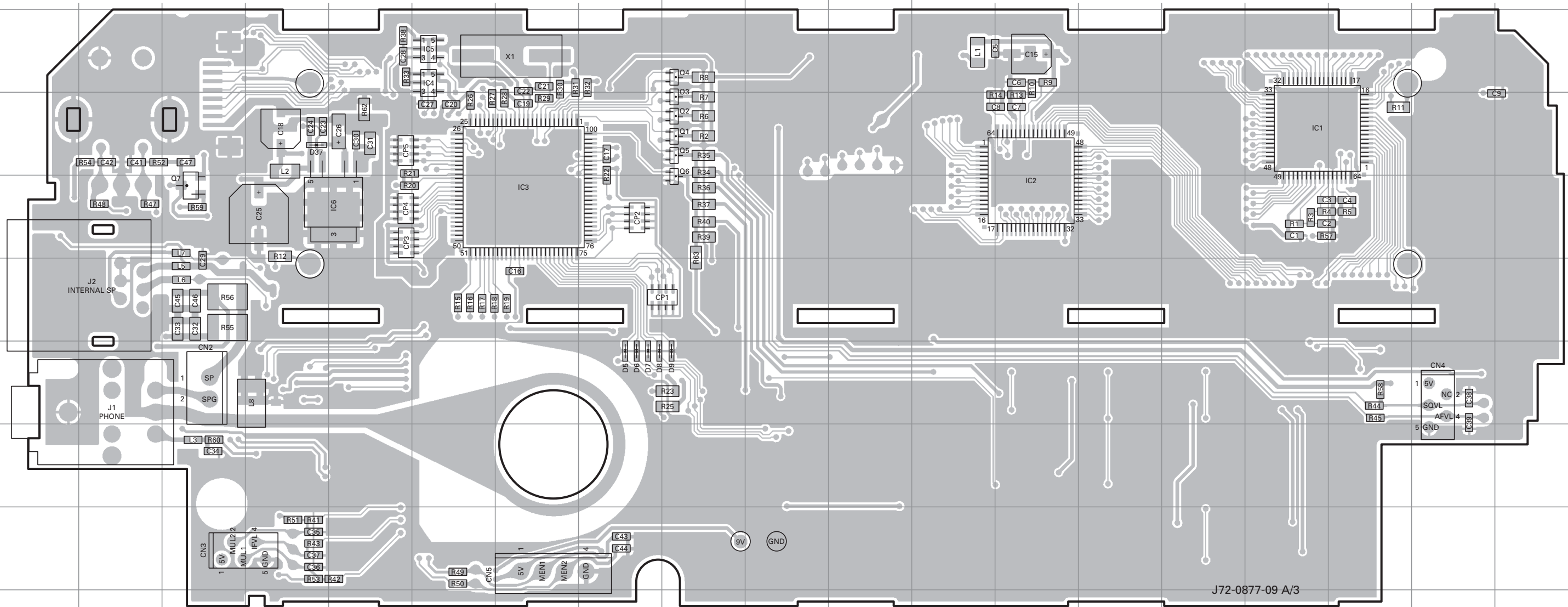


TS-480HX/480SAT PC BOARD

PC BOARD TS-480HX/480SAT

DISPLAY UNIT (X54-3410-00) (A/3, B/3, C/3) Foil side view (J72-0877-09)

DISPLAY UNIT (X54-3410-00) (A/3, B/3, C/3) Foil side view (J72-0877-09)



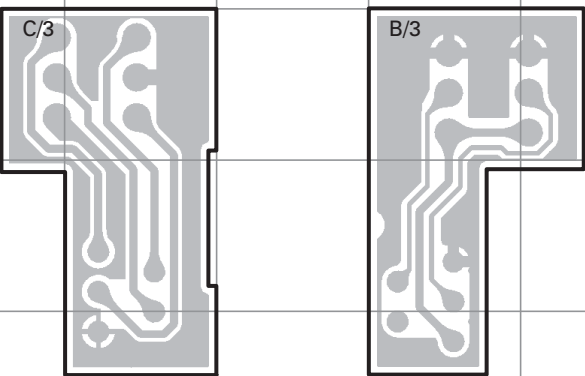
Component side

Layer 1

Layer 2

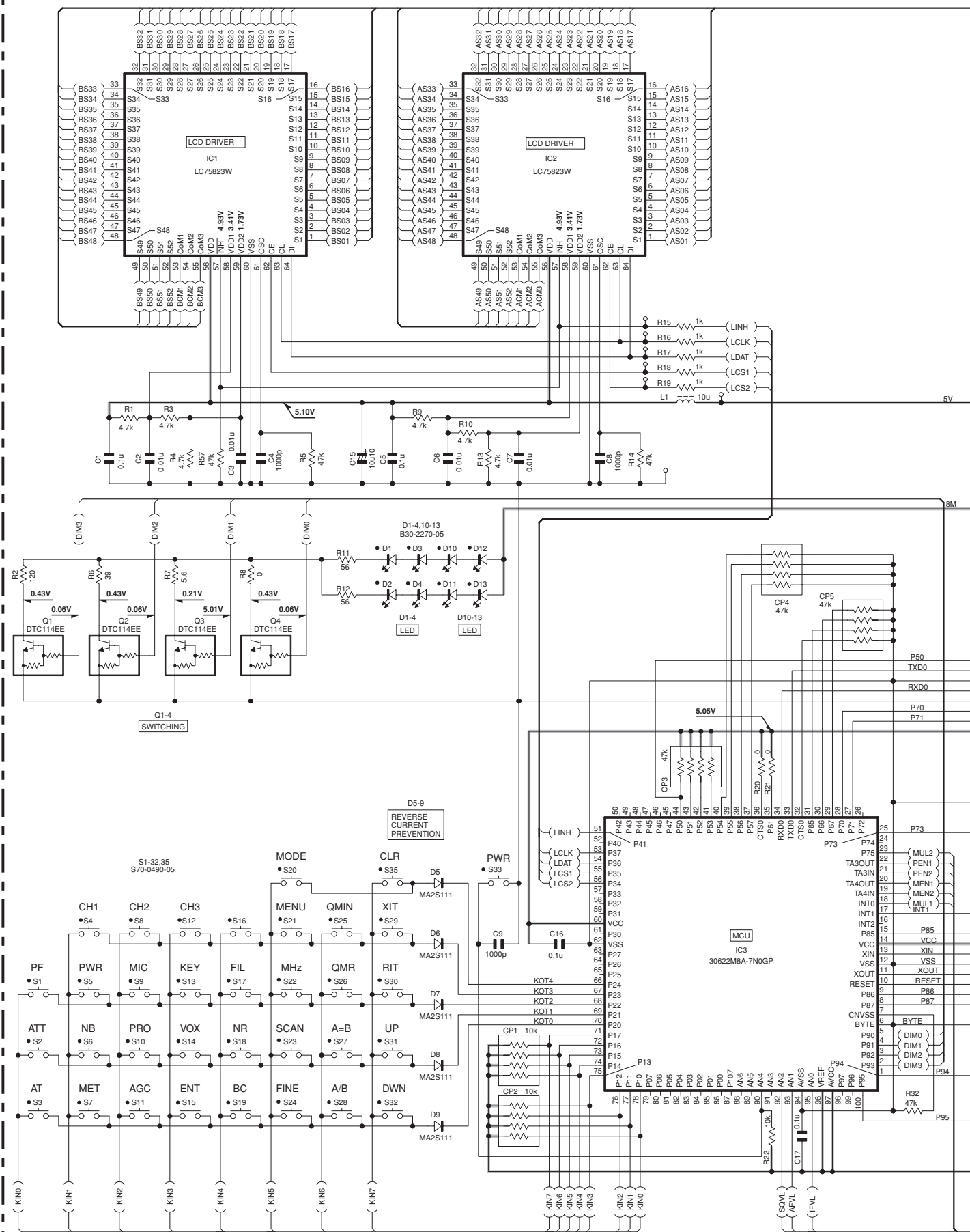
Foil side

Ref. No.	Address	Ref. No.	Address	Ref. No.	Address
IC1	4P	Q2	4I	D6	7H
IC2	5M	Q3	4I	D7	7H
IC3	5G	Q4	3I	D8	7H
IC4	3F	Q5	4I	D9	7I
IC5	3F	Q6	5I	D37	4D
IC6	5E	Q7	5C		
Q1	4I	D5	7H		



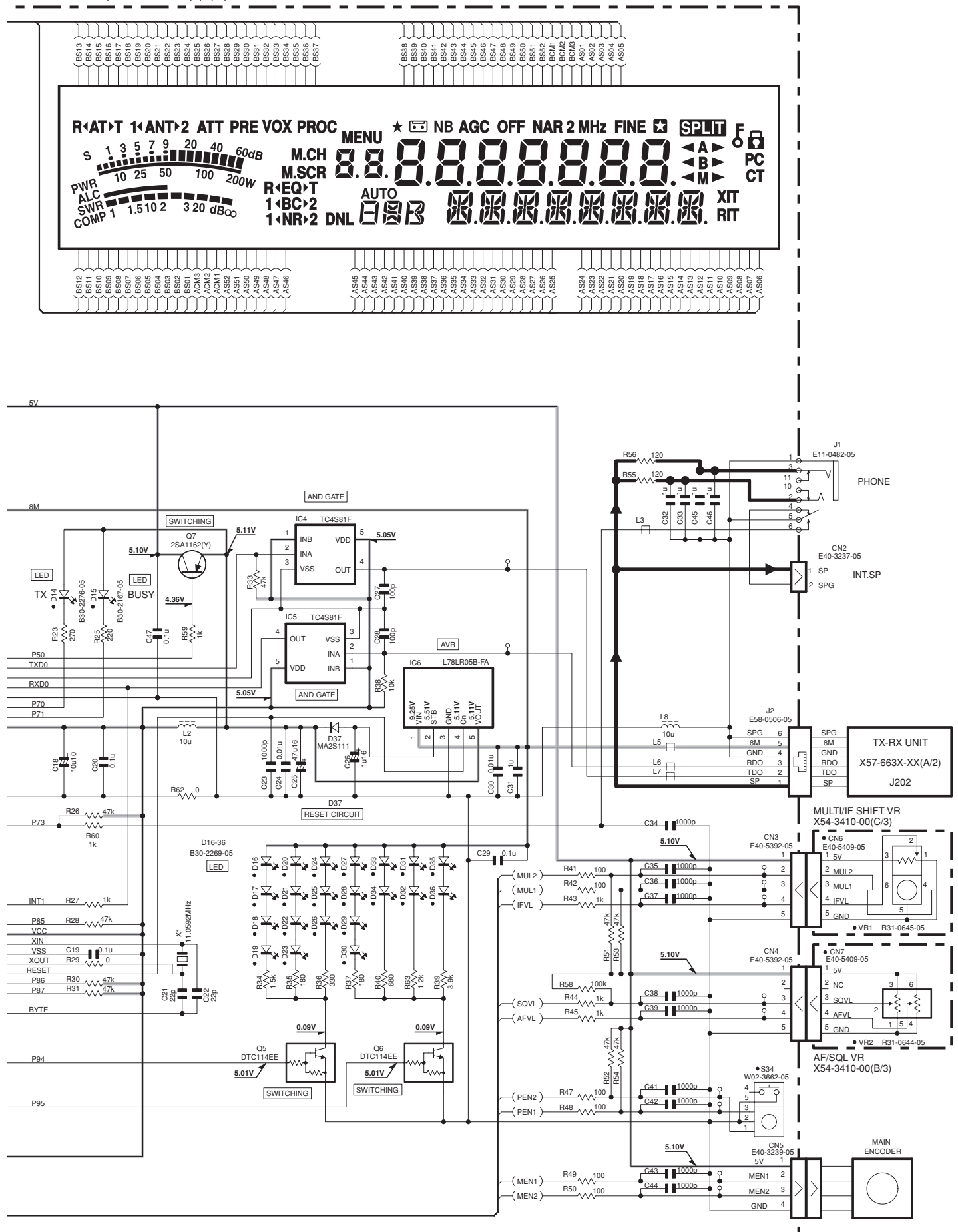
# TS-480HX/480SAT SCHEMATIC DIAGRAM

DISPLAY UNIT (X54-3410-00)(A/3)





DISPLAY UNIT (X54-3410-00) (A/3)

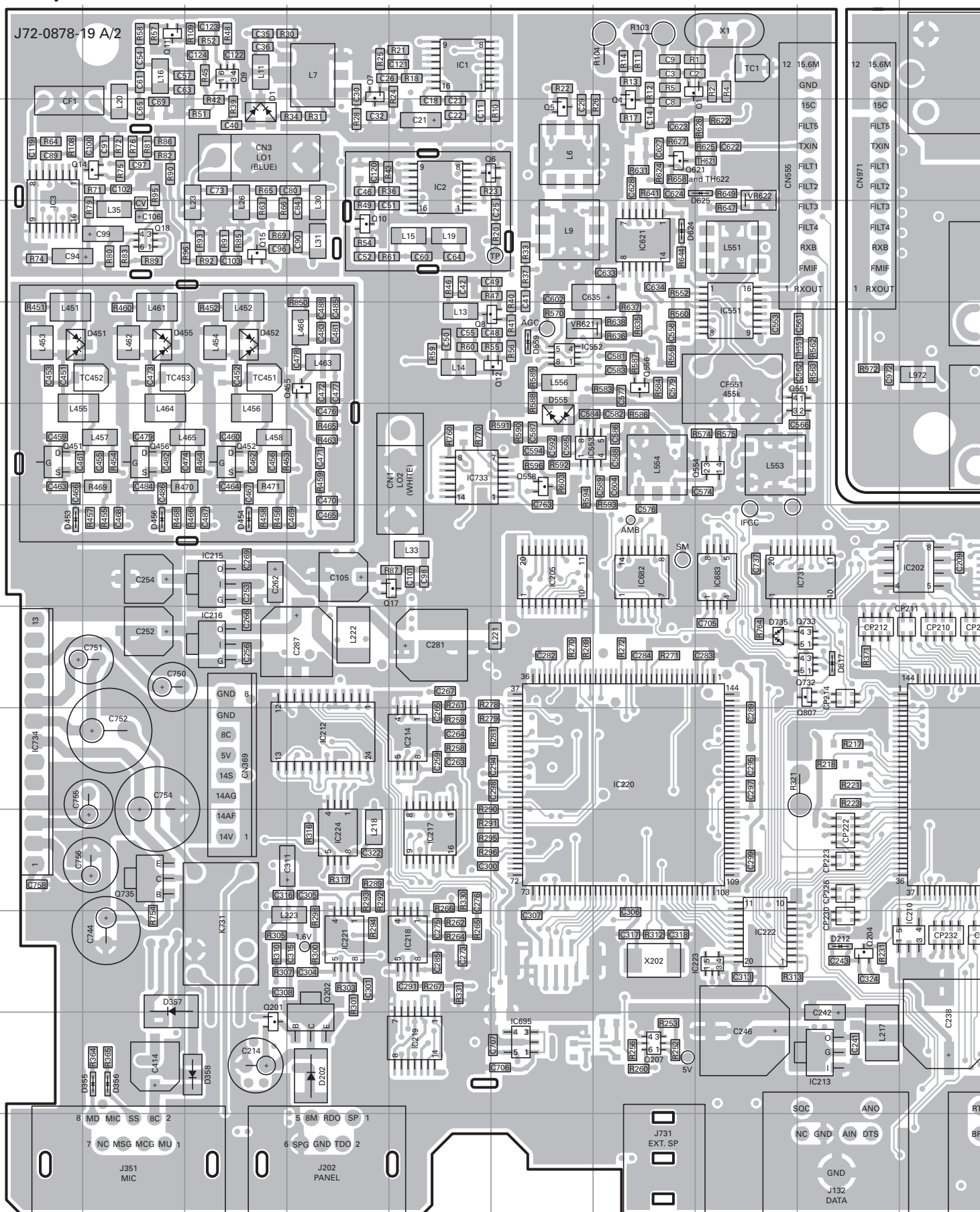




# TS-480HX/480SAT PC BOARD

TX-RX UNIT (X57-663X-XX) (A/2, B/2) 0-11 : KH 0-12 : KS 2-71 : EH 2-72 : ES

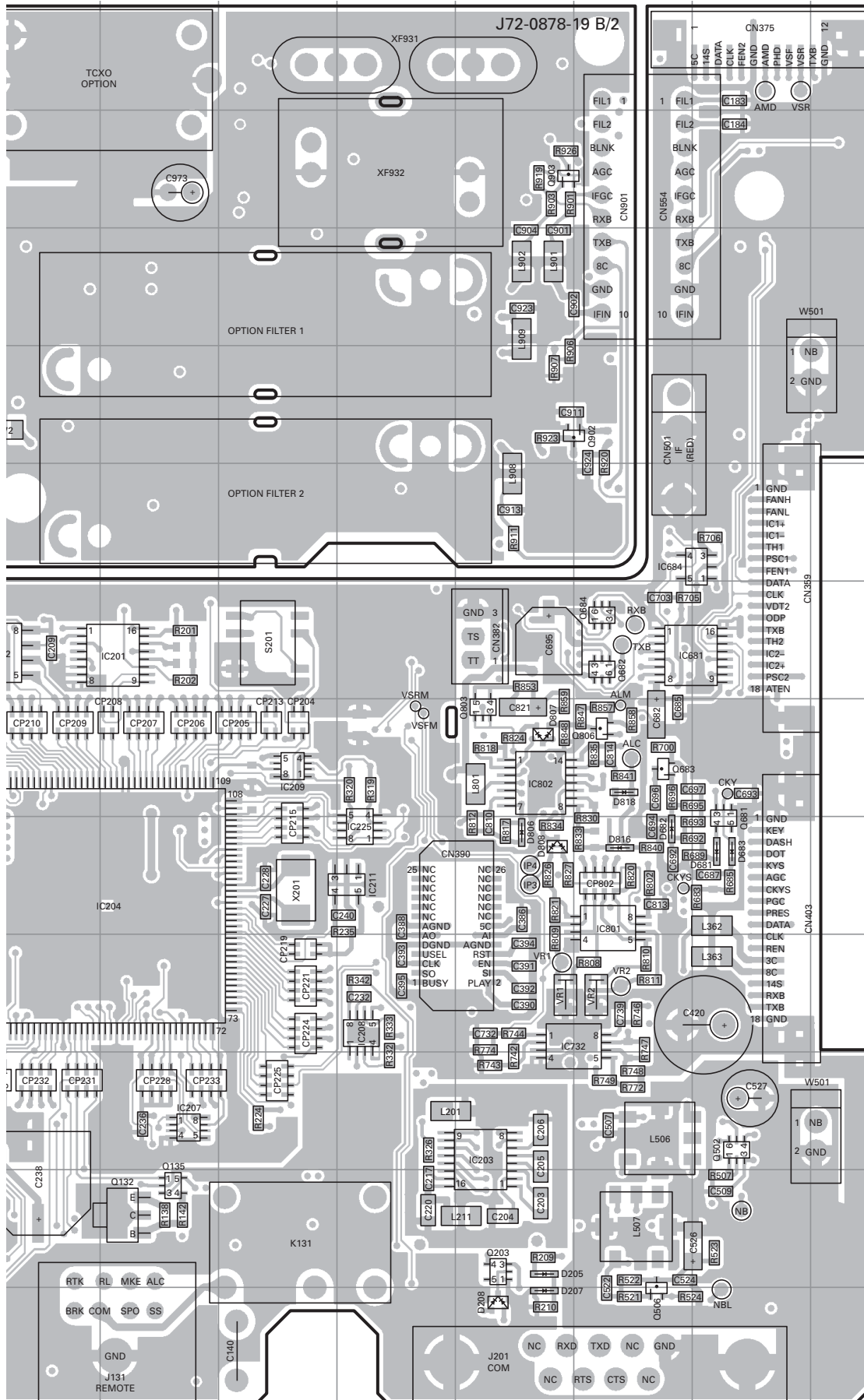
Component side view (J72-0878-19)



# PC BOARD TS-480HX/480SAT

**TX-RX UNIT (X57-663X-XX) (A/2, B/2) 0-11 : KH 0-12 : KS 2-71 : EH 2-72 : ES**

### Component side view (J72-0878-19)



Ref. No.	Address	Ref. No.	Address
IC1	2E	Q201	12C
IC2	3E	Q202	12D
IC3	4A	Q203	12N
IC201	7K	Q204	11I
IC202	7J	Q207	12G
IC203	11N	Q451	6A
IC204	9K	Q452	6C
IC205	7F	Q455	5D
IC207	11K	Q456	6B
IC208	10M	Q502	11P
IC209	8L	Q506	13O
IC210	11J	Q551	6I
IC211	9M	Q554	6H
IC212	9D	Q556	5G
IC213	12I	Q558	6F
IC214	9E	Q621	3G
IC215	7C	Q681	9P
IC216	8C	Q682	7O
IC217	10E	Q683	8O
IC218	11E	Q684	7O
IC219	12E	Q732	8I
IC220	9G	Q733	8I
IC221	11D	Q735	10B
IC222	11H	Q803	8N
IC223	11H	Q806	8O
IC224	10D	Q807	8I
IC225	9M	Q902	5N
IC551	5H	Q903	3N
IC552	5F	D1	3C
IC553	6F	D202	12D
IC621	4G	D205	12N
IC681	7O	D207	13N
IC682	7G	D208	13N
IC683	7H	D212	11I
IC684	6P	D355	12B
IC695	12F	D356	12B
IC731	7I	D357	12B
IC732	10N	D358	12C
IC733	6E	D451	5A
IC734	9A	D452	5C
IC801	9O	D453	7A
IC802	8N	D454	7C
Q1	2G	D455	5B
Q4	3G	D456	7B
Q5	3F	D555	6F
Q6	3E	D559	5F
Q7	3D	D624	4G
Q8	5F	D625	3H
Q9	2C	D681	9P
Q10	4D	D682	9O
Q11	2B	D683	9P
Q12	5F	D735	8H
Q14	3B	D806	9N
Q15	4C	D807	8N
Q17	7E	D808	9N
Q18	4B	D816	9O
Q132	12K	D817	8I
Q135	12K	D818	8O

Component side

Layer 1	
Layer 2	
Layer 3	
Layer 4	

Foil side

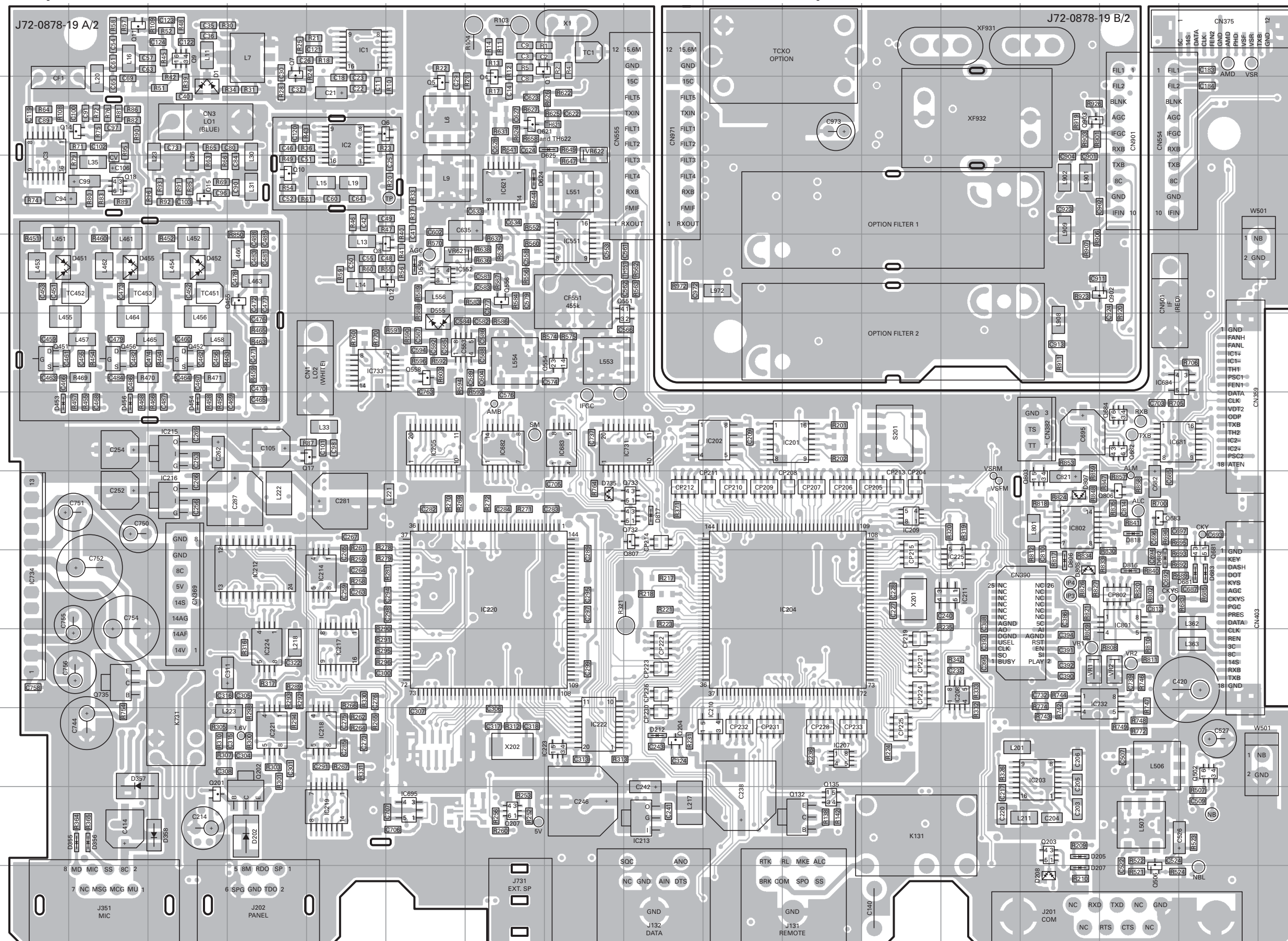


# TS-480HX/480SAT PC BOARD

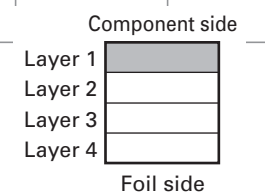
TX-RX UNIT (X57-663X-XX) (A/2, B/2) 0-11 : KH 0-12 : KS 2-71 : EH 2-72 : ES  
Component side view (J72-0878-19)

# PC BOARD TS-480HX/480SAT

TX-RX UNIT (X57-663X-XX) (A/2, B/2) 0-11 : KH 0-12 : KS 2-71 : EH 2-72 : ES  
Component side view (J72-0878-19)



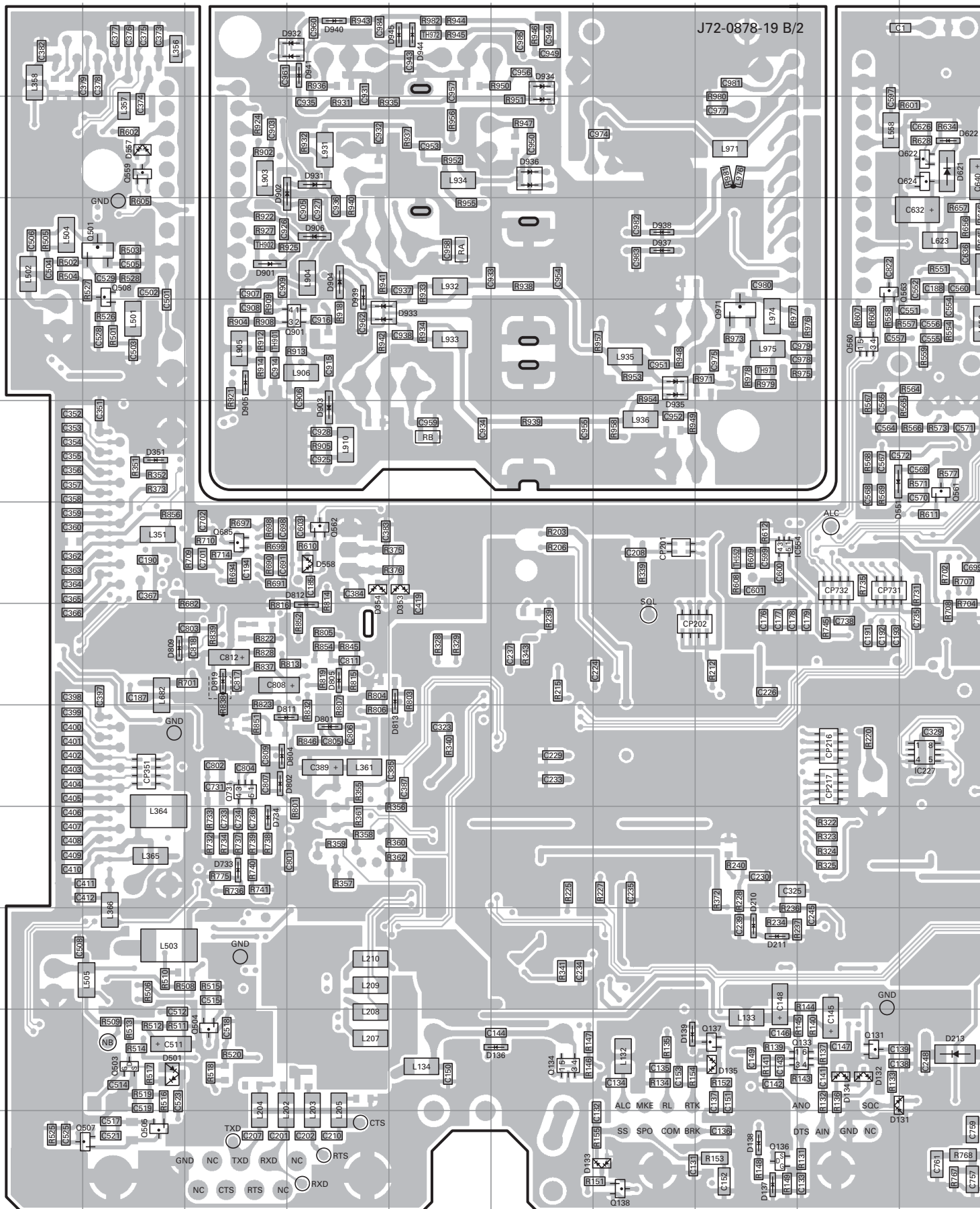
Ref. No.	Address	Ref. No.	Address
IC1	2E	Q201	12C
IC2	3E	Q202	12D
IC3	4A	Q203	12N
IC201	7K	Q204	11I
IC202	7J	Q207	12G
IC203	11N	Q451	6A
IC204	9K	Q452	6C
IC205	7F	Q455	5D
IC207	11K	Q456	6B
IC208	10M	Q502	11P
IC209	8L	Q506	13O
IC210	11J	Q551	6I
IC211	9M	Q554	6H
IC212	9D	Q556	5G
IC213	12I	Q558	6F
IC214	9E	Q621	3G
IC215	7C	Q681	9P
IC216	8C	Q682	7O
IC217	10E	Q683	8O
IC218	11E	Q684	7O
IC219	12E	Q732	8I
IC220	9G	Q733	8I
IC221	11D	Q735	10B
IC222	11H	Q803	8N
IC223	11H	Q806	8O
IC224	10D	Q807	8I
IC225	9M	Q902	5N
IC551	5H	Q903	3N
IC552	5F	D1	3C
IC553	6F	D202	12D
IC621	4G	D205	12N
IC681	7O	D207	13N
IC682	7G	D208	13N
IC683	7H	D212	11I
IC684	6P	D355	12B
IC695	12F	D356	12B
IC731	7I	D357	12B
IC732	10N	D358	12C
IC733	6E	D451	5A
IC734	9A	D452	5C
IC801	9O	D453	7A
IC802	8N	D454	7C
Q1	2G	D455	5B
Q4	3G	D456	7B
Q5	3F	D555	6F
Q6	3E	D559	5F
Q7	3D	D624	4G
Q8	5F	D625	3H
Q9	2C	D681	9P
Q10	4D	D682	9O
Q11	2B	D683	9P
Q12	5F	D735	8H
Q14	3B	D806	9N
Q15	4C	D807	8N
Q17	7E	D808	9N
Q18	4B	D816	9O
Q132	12K	D817	8I
Q135	12K	D818	8O



# TS-480HX/480SAT PC BOARD

TX-RX UNIT (X57-663X-XX) (A/2. B/2) 0-11 : KH 0-12 : KS 2-71 : EH 2-72 : ES

Foil side view (J72-0878-19)

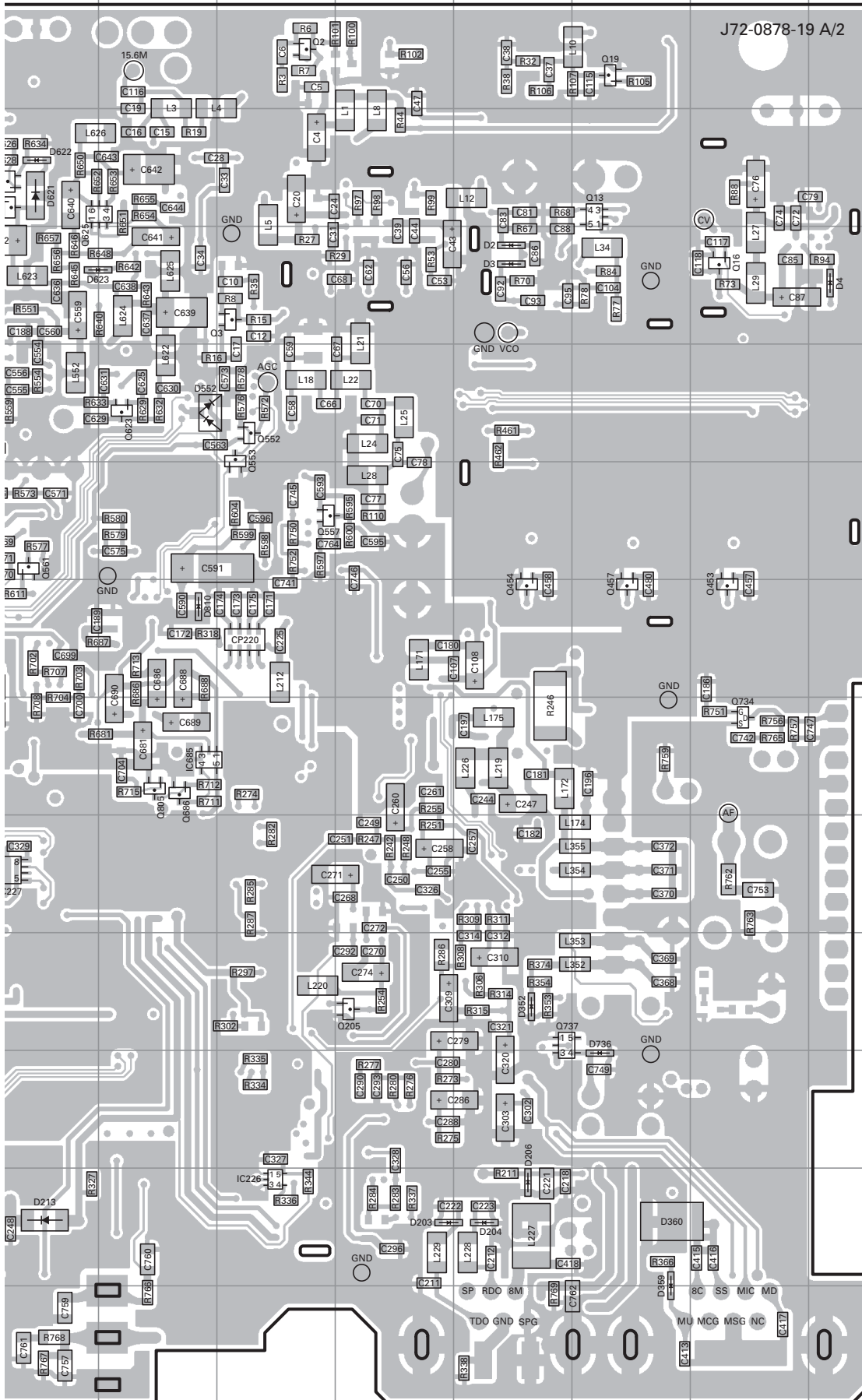




# PC BOARD TS-480HX/480SAT

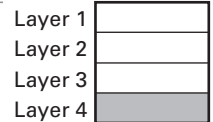
TX-RX UNIT (X57-663X-XX) (A/2, B/2) 0-11 : KH 0-12 : KS 2-71 : EH 2-72 : ES

Foil side view (J72-0878-19)



Ref. No.	Address	Ref. No.	Address
IC226	12L	D138	13H
IC227	9J	D139	12G
IC554	7H	D203	12M
IC685	8K	D204	12N
Q2	2L	D206	12N
Q3	4L	D210	11H
Q13	3O	D211	11H
Q16	4P	D213	12J
Q19	2O	D351	6B
Q131	12I	D352	10N
Q133	12I	D353	7E
Q134	12F	D354	7D
Q136	13H	D359	13O
Q137	12H	D360	12O
Q138	13G	D501	12B
Q205	10M	D551	6I
Q453	7P	D552	5K
Q454	7N	D557	3B
Q457	7O	D558	7D
Q501	4B	D621	3J
Q503	12B	D622	3J
Q504	12C	D623	4J
Q505	13B	D733	10C
Q507	13B	D734	10C
Q508	5B	D736	11O
Q552	5L	D801	9D
Q553	6L	D802	9C
Q557	6L	D804	9C
Q559	3B	D805	8D
Q560	5I	D809	8B
Q561	6J	D810	7K
Q562	7D	D811	9C
Q563	4I	D812	8D
Q622	3J	D813	9E
Q623	5K	D819	8C
Q624	3J	D901	4C
Q625	3J	D902	4D
Q685	7C	D903	6D
Q686	8K	D904	4D
Q731	9C	D905	5C
Q734	8P	D906	4D
Q737	10N	D931	3D
Q805	8K	D932	2D
Q901	5D	D933	5D
Q971	5H	D934	3F
D2	4N	D935	5G
D3	4N	D936	3F
D4	4Q	D937	4G
D131	12I	D938	4G
D132	12I	D939	5D
D133	13G	D940	2D
D134	12I	D941	2D
D135	12H	D944	2E
D136	12F	D945	2E
D137	13H		

Component side



Foil side



# TS-480HX/480SAT PC BOARD

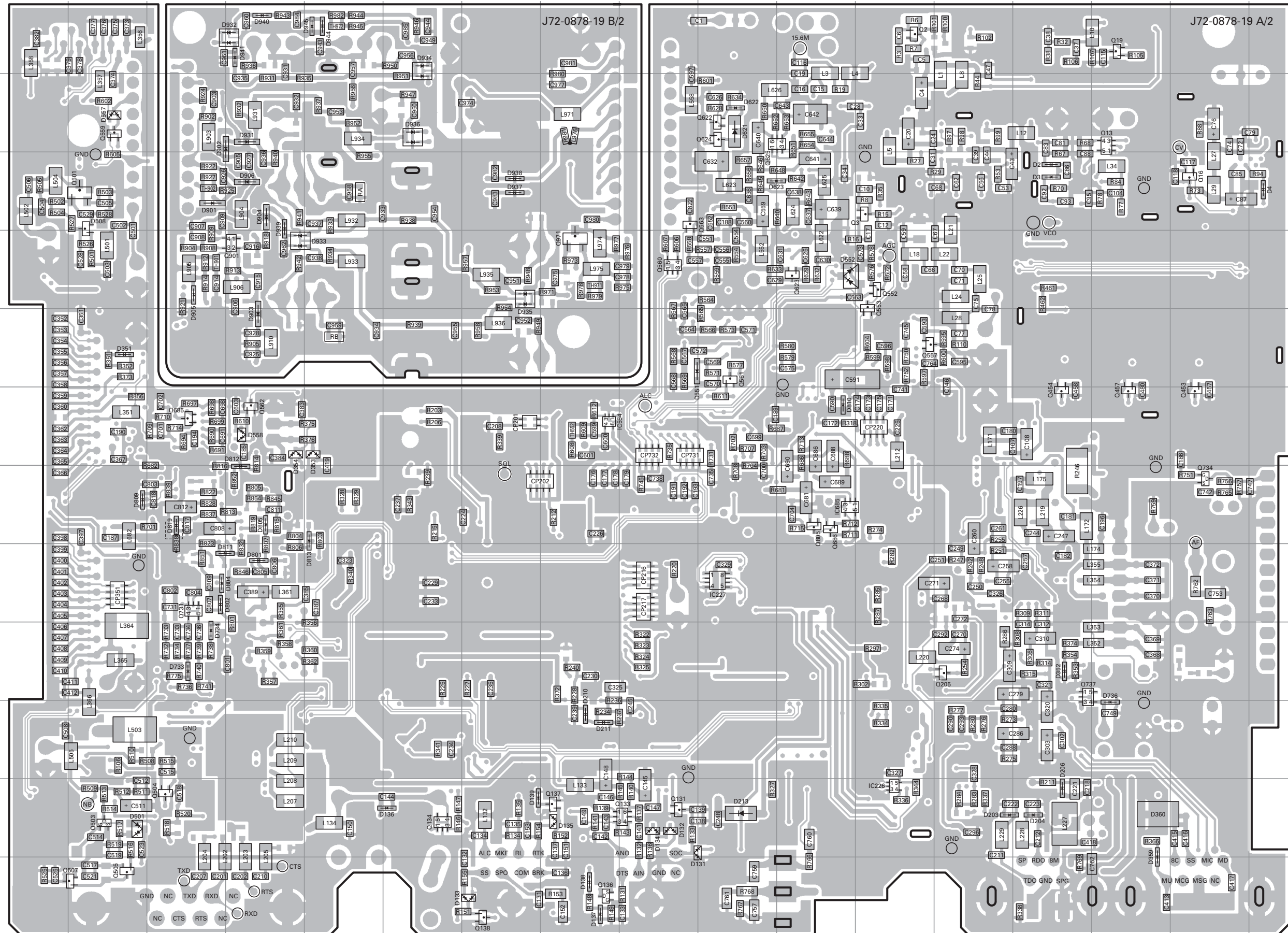
**TX-RX UNIT (X57-663X-XX) (A/2. B/2) 0-11 : KH 0-12 : KS 2-71 : EH 2-72 : ES**

**Foil side view (J72-0878-19)**

# PC BOARD TS-480HX/480SAT

TX-RX UNIT (X57-663X-XX) (A/2, B/2) 0-11 : KH 0-12 : KS 2-71 : EH 2-72 : ES

**Foil side view (J72-0878-19)**



Ref. No.	Address	Ref. No.	Address
IC226	12L	D138	13H
IC227	9J	D139	12G
IC554	7H	D203	12M
IC685	8K	D204	12N
Q2	2L	D206	12N
Q3	4L	D210	11H
Q13	3O	D211	11H
Q16	4P	D213	12J
Q19	2O	D351	6B
Q131	12I	D352	10N
Q133	12I	D353	7E
Q134	12F	D354	7D
Q136	13H	D359	13O
Q137	12H	D360	12O
Q138	13G	D501	12B
Q205	10M	D551	6I
Q453	7P	D552	5K
Q454	7N	D557	3B
Q457	7O	D558	7D
Q501	4B	D621	3J
Q503	12B	D622	3J
Q504	12C	D623	4J
Q505	13B	D733	10C
Q507	13B	D734	10C
Q508	5B	D736	11O
Q552	5L	D801	9D
Q553	6L	D802	9C
Q557	6L	D804	9C
Q559	3B	D805	8D
Q560	5I	D809	8B
Q561	6J	D810	7K
Q562	7D	D811	9C
Q563	4I	D812	8D
Q622	3J	D813	9E
Q623	5K	D819	8C
Q624	3J	D901	4C
Q625	3J	D902	4D
Q685	7C	D903	6D
Q686	8K	D904	4D
Q731	9C	D905	5C
Q734	8P	D906	4D
Q737	10N	D931	3D
Q805	8K	D932	2D
Q901	5D	D933	5D
Q971	5H	D934	3F
D2	4N	D935	5G
D3	4N	D936	3F
D4	4Q	D937	4G
D131	12I	D938	4G
D132	12I	D939	5D
D133	13G	D940	2D
D134	12I	D941	2D
D135	12H	D944	2E
D136	12F	D945	2E
D137	13H		

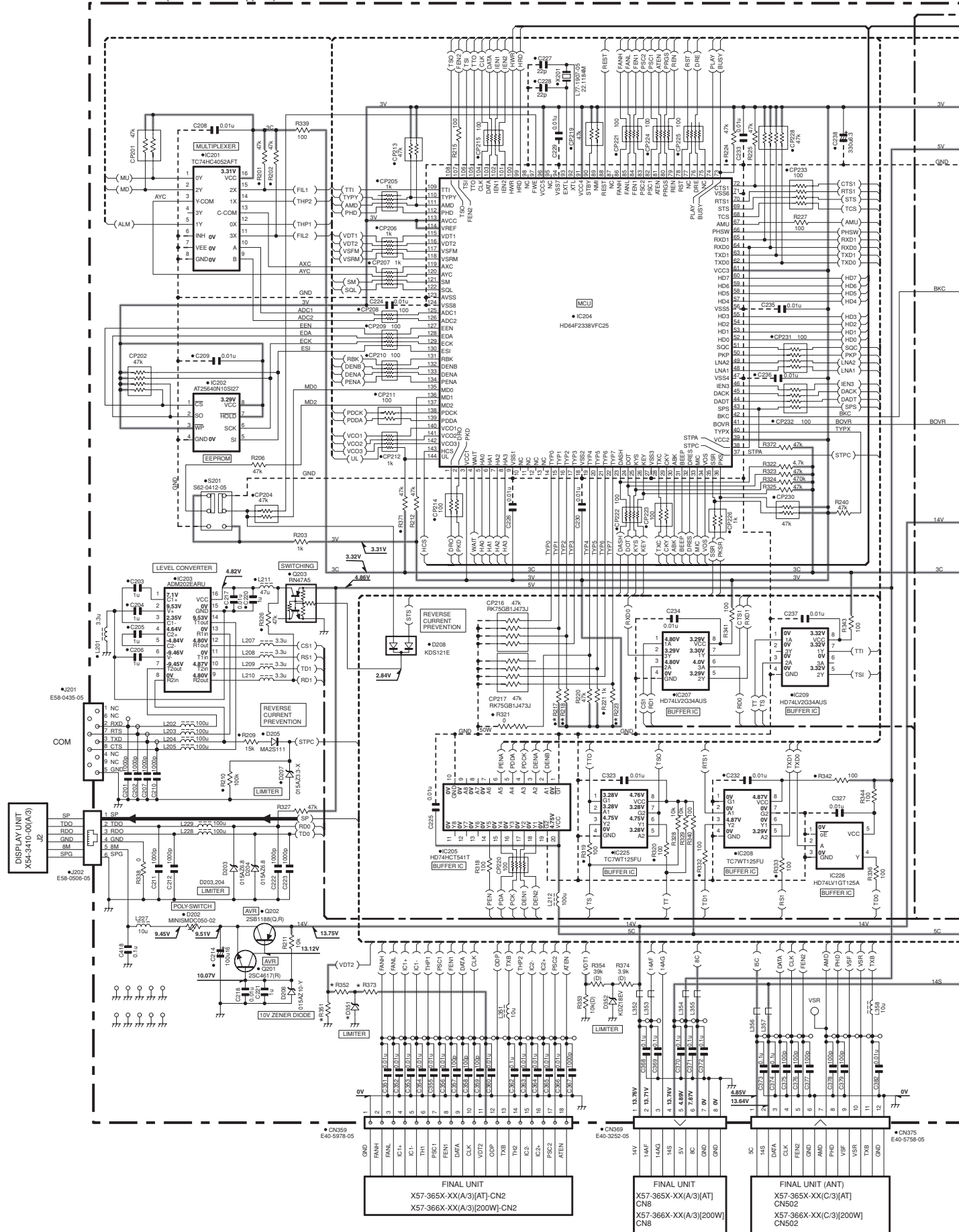
Diagram illustrating the structure of a 4-layer laminate:

- Layer 1 (Top layer, white)
- Layer 2 (Second layer, white)
- Layer 3 (Third layer, white)
- Layer 4 (Bottom layer, gray, labeled "Foil side")

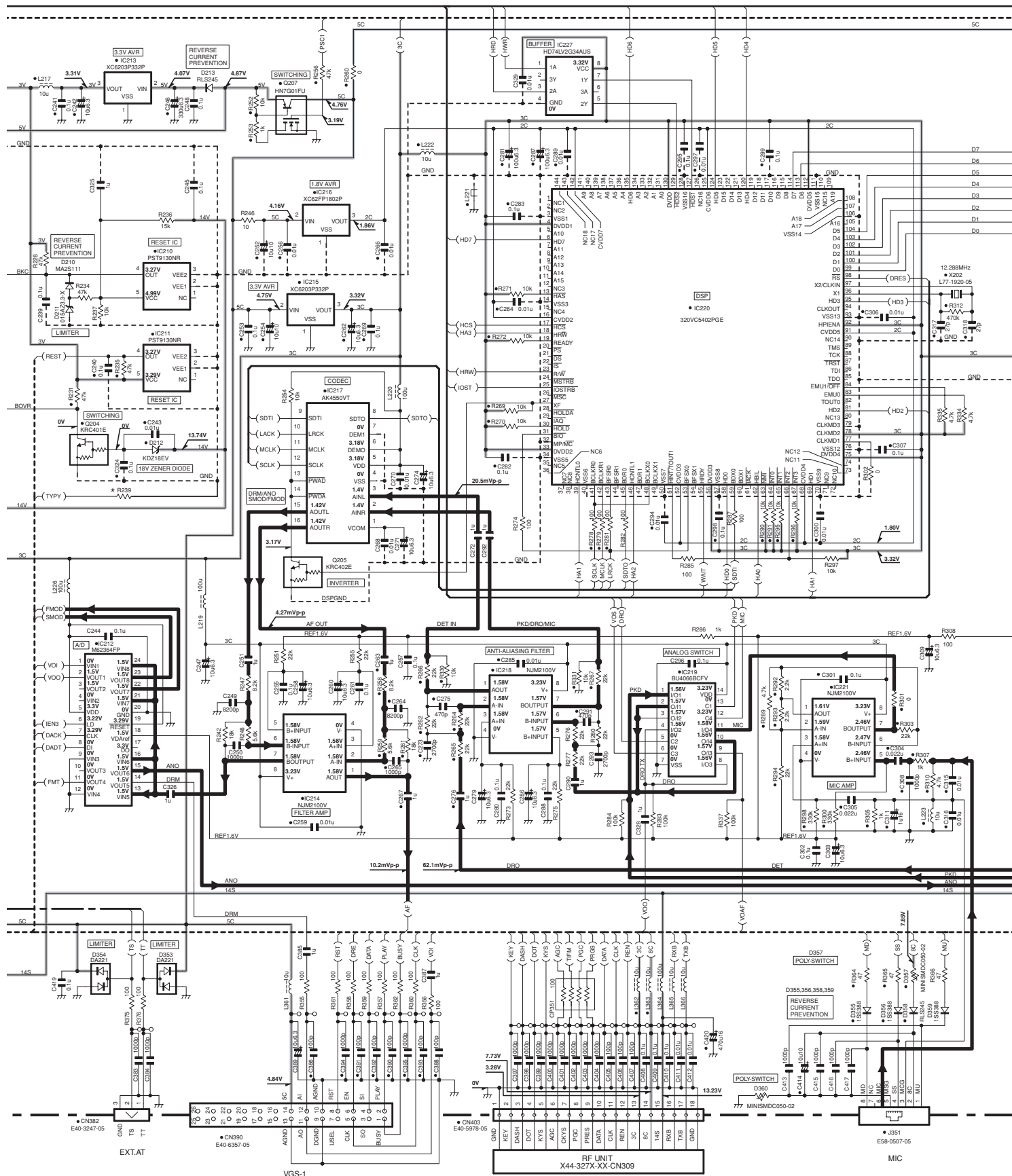
The top surface is labeled "Component side".

# TS-480HX/480SAT SCHEMATIC DIAGRAM

TX-RX UNIT (X57-663X-XX)(A/2)



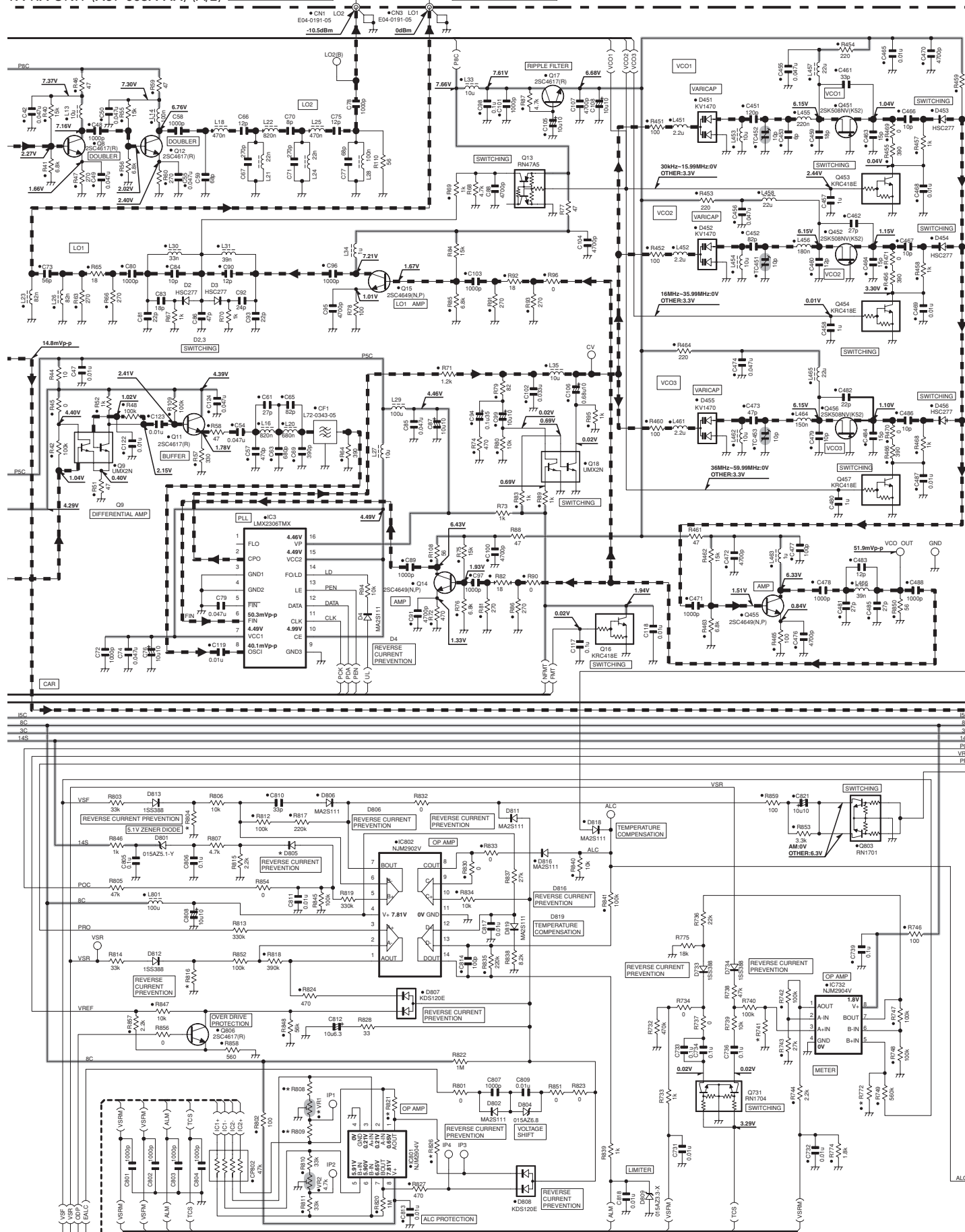
TX-RX UNIT (X57-663X-XX) (A/2)





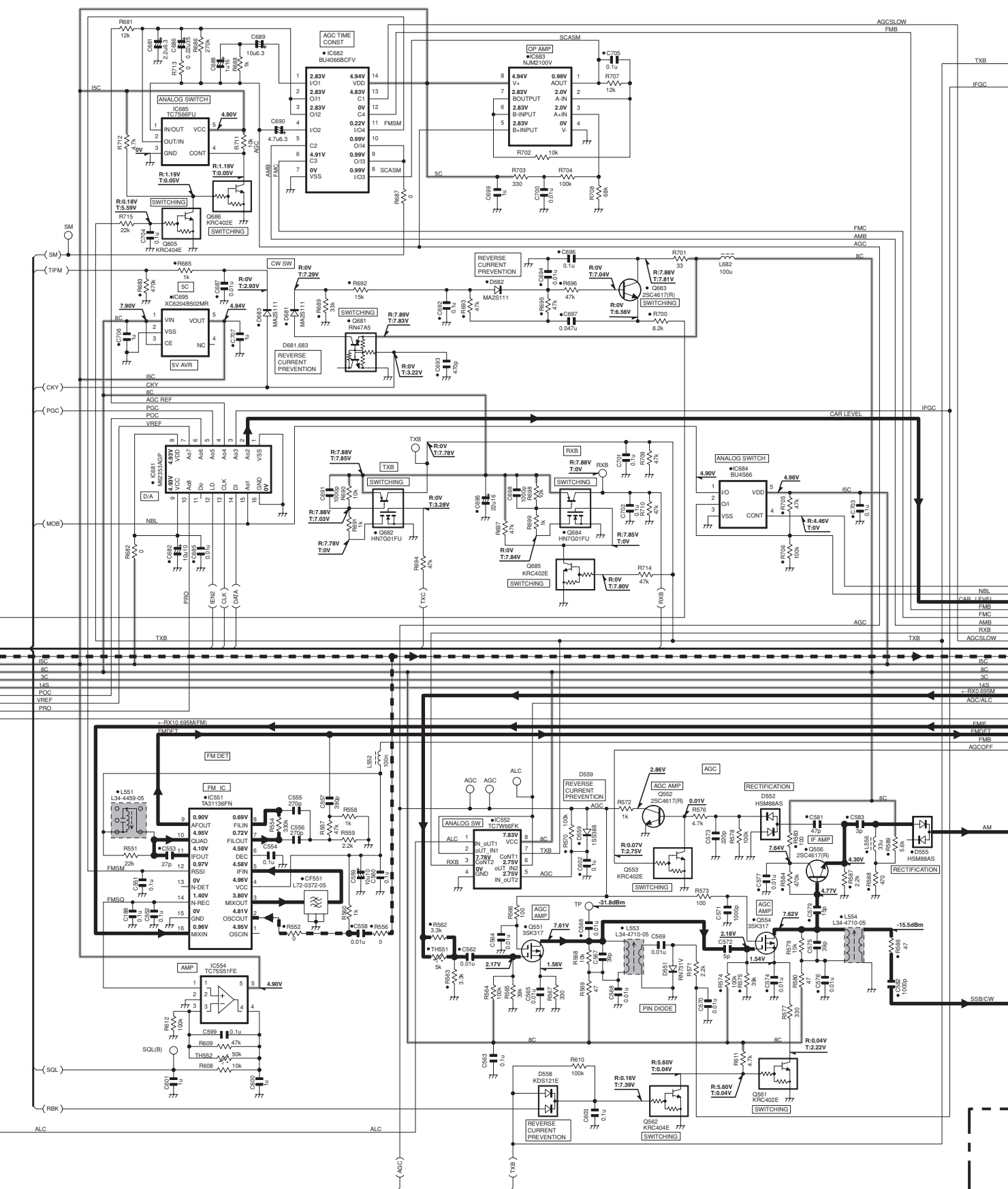
## TX-RX UNIT (X57-663X-XX) (A/2)



RF UNIT  
X44-327X-XX -CN153

# TS-480HX/480SAT SCHEMATIC DIAGRAM

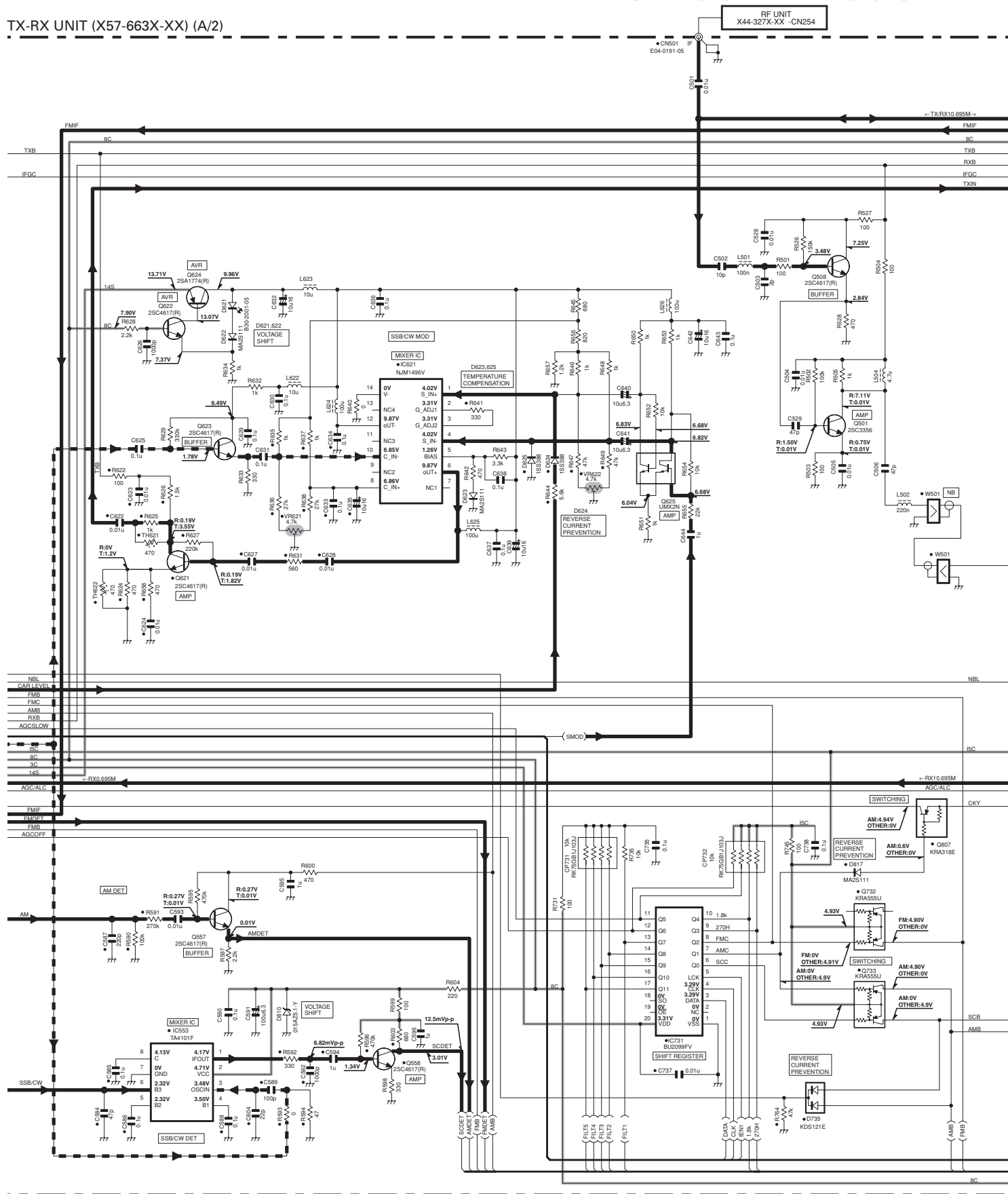
TX-RX UNIT (X57-663X-XX) (A/2)





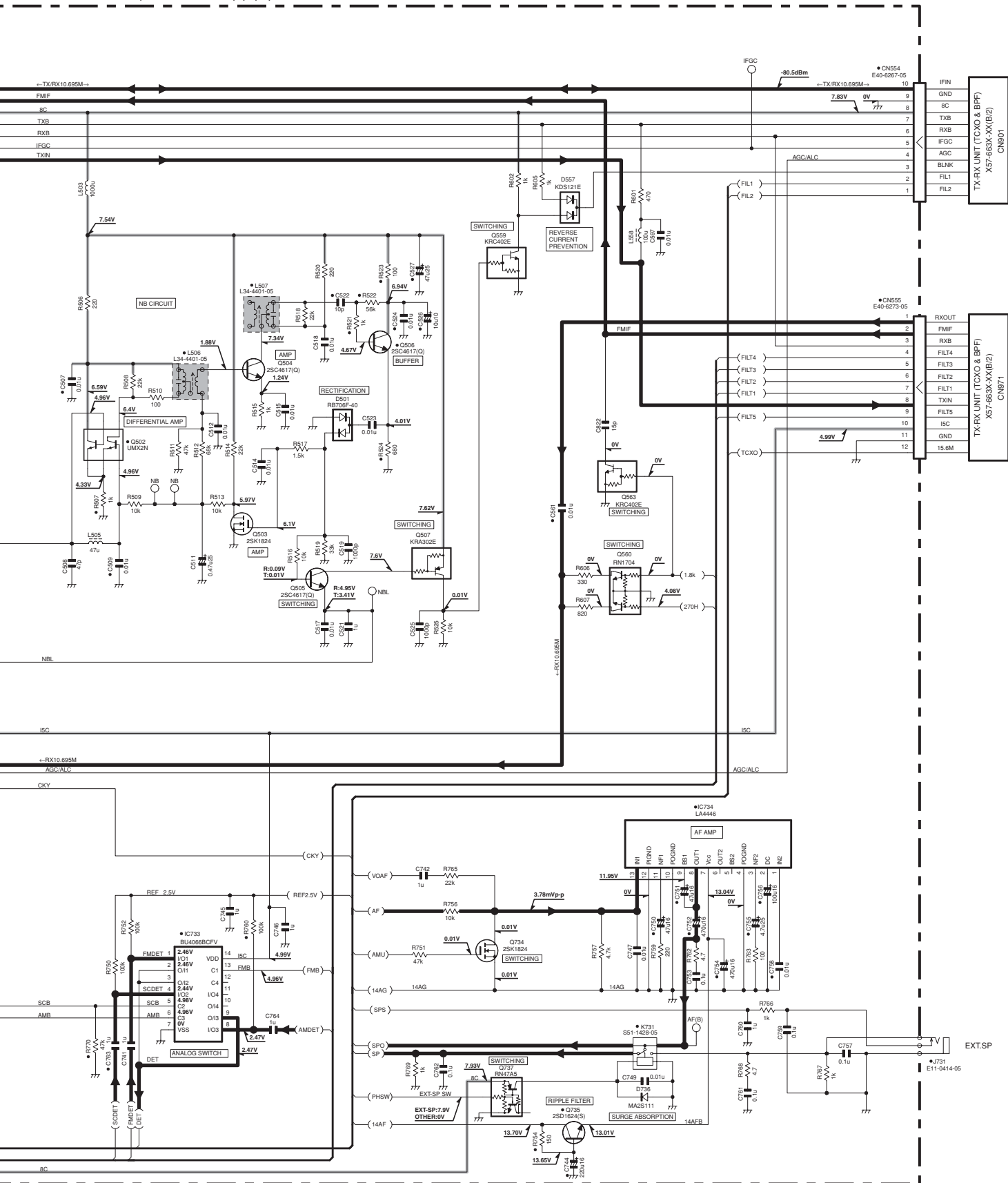
# SCHEMATIC DIAGRAM TS-480HX/480SAT

TX-RX UNIT (X57-663X-XX) (A/2)



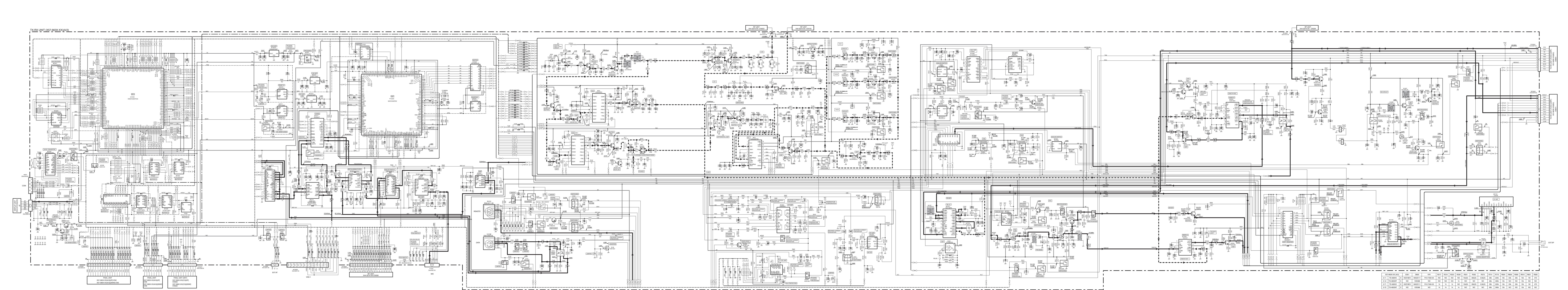
# TS-480HX/480SAT SCHEMATIC DIAGRAM

TX-RX UNIT (X57-663X-XX) (A/2)



	X57-663X-XX (A/2)	D351	D805	VR1	R217	R218	R223	R239	R351	R352	R373	R741	R772	R804	R808	R809	R816	R821	R826
0-11	TS-480HX	K	KD218EV	MA2S111	R12-7484-05	NO	NO	NO	NO	10k(D)	39k(D)	3.9k(D)	39k	220k	10k	33k	33k	1M	470
0-12	TS-480SAT	K	NO	1SS388	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	10k	NO
2-71	TS-480HX	E	KD218EV	MA2S111	R12-7484-05	1k	1k	1k	NO	10k(D)	39k(D)	3.9k(D)	39k	220k	10k	33k	33k	10k	1M
2-72	TS-480SAT	E	NO	1SS388	NO	1k	1k	1k	1k	NO	NO	NO	68k	390k	15k	NO	NO	15k	NO





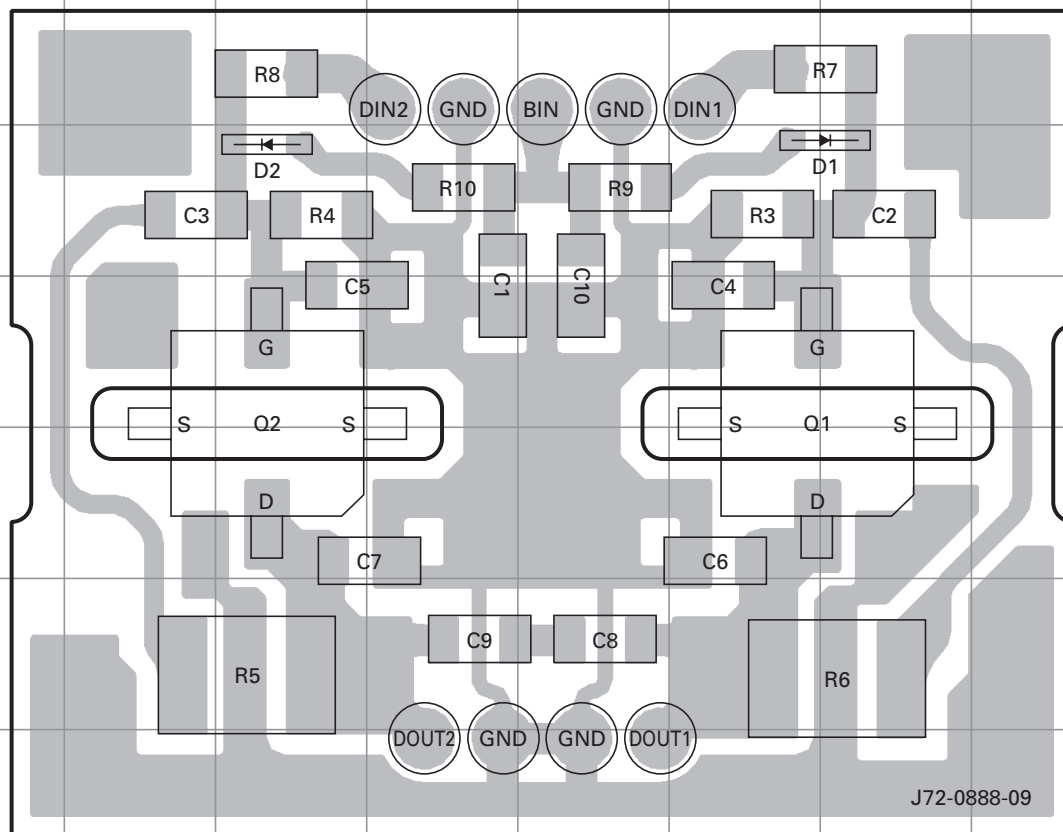


1
2
3
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6
7

1

# TS-480HX/480SAT PC BOARD

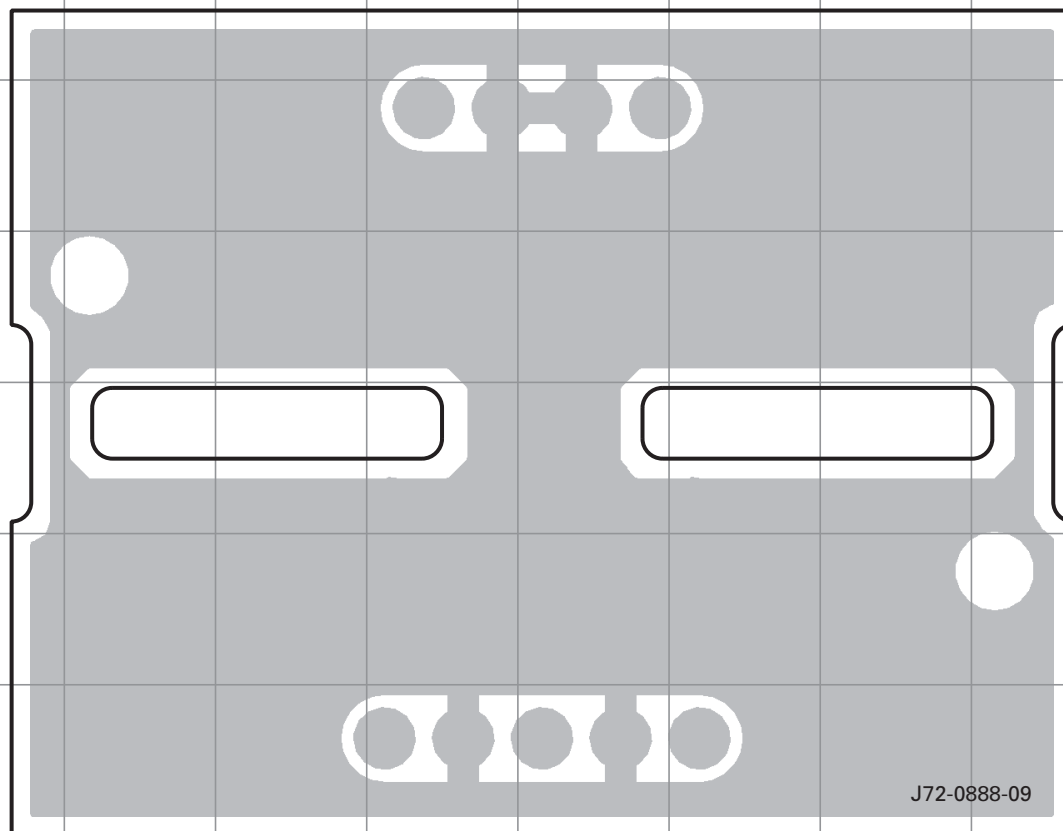
SUB UNIT (X58-4900-XX) -00 : KH,EH -01 : KS,ES  
Component side view (J72-0888-09)



Ref No.	Address
Q1	4F
Q2	4C
D1	3G
D2	3C

Component side  
Layer 1  
Layer 2  
Foil side

SUB UNIT (X58-4900-XX) -00 : KH,EH -01 : KS,ES  
Foil side view (J72-0888-09)



Component side  
Layer 1  
Layer 2  
Foil side

# TS-480HX/480SAT

## TERMINAL FUNCTION

### RF UNIT (X44-327)

Pin No.	Name	I/O	Function
<b>CN309 (to TX-RX unit A/2)</b>			
1	GND	-	GND
2	KEY	I	KEY down signal
3	DASH	I	Electronic Keyer dash signal
4	DOT	I	Electronic Keyer dot signal
5	KYS	I	KEY jack judgement signal
6	AGC	I	Automatic gain control voltage
7	CKYS	I	CKY mute signal
8	PGC	I	Power gain control voltage
9	PRES	I	Pre-AMP switching signal
10	DATA	I	Data
11	CLK	I	Clock
12	REN	I	Enable signal for RF unit
13	3C	I	Switched common 3V
14	8C	I	Switched common 8V
15	14S	I	Switched 14V
16	RXB	I	RX 8V
17	TXB	I	TX 8V
18	GND	-	GND

### FINAL UNIT (X45-365 A/3 & X45-366 A/3)

Pin No.	Name	I/O	Function
<b>CN3 (to SUB unit)</b>			
1	DIN1	O	Drive output 1
2	GND	-	GND
3	BIN	O	Bias output
4	GND	-	GND
5	DIN2	O	Drive output 2
<b>CN4 (to SUB unit)</b>			
1	DOUT2	I	Drive input 2
2	GND	-	GND
3	GND	-	GND
4	DOUT1	I	Drive input 1
<b>CN2 (to TX-RX unit A/2) : X45-365 only</b>			
1	ATEN	I	Enable for internal AT circuit
2	ATL5	I	AT 5MHz relay switch
3	NC	-	NC
4	NC	-	NC
5	NC	-	NC

Pin No.	Name	I/O	Function
6	TXB	I	TX 8V
7	NC	-	NC
8	NC	-	NC
9	CLK	I	Clock
10	DATA	I	Data
11	FEN1	I	Enable for internal AT circuit
12	PSC1	I	Power supply SW control signal 1
13	TH1	O	Thermal protect detection voltage 1
14	IC1-	O	Current detection 1 negative
15	IC1+	O	Current detection 1 positive
16	FANL	I	FAN low speed
17	FANH	I	FAN high speed
18	GND	-	GND
<b>CN2 (to TX-RX unit A/2) : X45-366 only</b>			
1	NC	-	NC
2	PSC2	I	Power supply SW control signal 2
3	IC2+	O	Current detection 2 positive
4	IC2-	O	Current detection 2 negative
5	TH2	O	Thermal protect det voltage 2
6	TXB	I	TX 8V
7	ODP	O	Over drive protection detection voltage
8	VDT2	O	2nd power supply detection
9	NC	-	NC
10	NC	-	NC
11	NC	-	NC
12	PSC1	I	Power supply SW control signal 1
13	TH1	O	Thermal protect detection voltage 1
14	IC1-	O	Current detection 1 negative
15	IC1+	O	Current detection 1 positive
16	FANL	I	FAN low speed
17	FANH	I	FAN high speed
18	GND	-	GND
<b>CN5 (to Connector for AT)</b>			
1	14AT	O	Power supply for EXT. AT
2	GND	-	GND
<b>CN8 (to TX-RX unit A/2)</b>			
1	14V	O	Non switched 14V
2	14AF	O	Power supply for audio IC
3	14AG	-	GND for audio IC
4	14S	O	Switched 14V



# TS-480HX/480SAT

## TERMINAL FUNCTION

Pin No.	Name	I/O	Function
5	5V	O	Non switched 5V
6	8C	O	Switched common 8V
7	GND	-	GND
8	GND	-	GND
<b>CN9 (to FAN1)</b>			
1	FAN1+	O	Power supply for fan
2	FAN1-	O	Power supply for fan
<b>CN10 (to FAN2) : X45-366 only</b>			
1	FAN2+	O	Power supply for fan
2	FAN2-	O	Power supply for fan

### FINAL (FILTER) UNIT (X45-365 B/3 & X45-366 B/3)

Pin No.	Name	I/O	Function
<b>CN101 (to FINAL (ANT) unit C/3)</b>			
1	LED	I	Power-on LED
2	GND	-	GND
3	21M	I	LPF selection signal
4	2M	I	LPF selection signal
5	7M	I	LPF selection signal
6	28M	I	LPF selection signal
7	14M	I	LPF selection signal
8	4M	I	LPF selection signal
9	10M	I	LPF selection signal
10	50M	I	LPF selection signal

### FINAL (ANT) UNIT (X45-365 C/3 & X45-366 C/3)

Pin No.	Name	I/O	Function
<b>CN501 (to FINAL (FILTER) unit B/3)</b>			
1	50M	O	LPF selection signal
2	10M	O	LPF selection signal
3	4M	O	LPF selection signal
4	14M	O	LPF selection signal
5	28M	O	LPF selection signal
6	7M	O	LPF selection signal
7	2M	O	LPF selection signal
8	21M	O	LPF selection signal
9	GND	-	GND
10	LED	O	Power-on LED
<b>CN502 (to TX-RX unit A/2) : X45-365 only</b>			
1	GND	-	GND

Pin No.	Name	I/O	Function
2	TXB	I	TX 8V
3	VSR	O	Reflected wave detection voltage
4	VSF	O	Forward wave detection voltage
5	PHD	O	Phase comparison detection voltage
6	AMD	O	Amplitude comparison detection voltage
7	GND	-	GND
8	FEN2	I	Enable for Final (ANT) unit (C/3)
9	CLK	I	Clock
10	DATA	I	Data
11	14S	I	Switched 14V
12	5C	I	Switched common 5V

### CN502 (to TX-RX unit A/2) : X45-366 only

1	GND	-	GND
2	TXB	I	TX 8V
3	VSR	O	Reflected wave detection voltage
4	VSF	O	Forward wave detection voltage
5	GND	-	GND
6	GND	-	GND
7	GND	-	GND
8	FEN2	I	Enable for Final (ANT) unit (C/3)
9	CLK	I	Clock
10	DATA	I	Data
11	14S	I	Switched 14V
12	5C	I	Switched common 5V

### DISPLAY UNIT (X54-341 A/3)

Pin No.	Name	I/O	Function
<b>J2 (to TX-RX unit A/2)</b>			
1	SP	I	Speaker input
2	TDO	O	Serial data output
3	RDO	I	Serial data input
4	GND	-	GND
5	8M	I	8V
6	SPG	-	Speaker GND
<b>CN2 (to Internal SP)</b>			
1	SP	O	Speaker output
2	SPG	-	Speaker GND
<b>CN3 (to MULTI/IF SHIFT VR)</b>			
1	5V	O	5V
2	MUL2	I	Multi encoder pulse2

# TS-480HX/480SAT

## TERMINAL FUNCTION

Pin No.	Name	I/O	Function
3	MUL1	I	Multi encoder pulse1
4	IFVL	I	IF SHIFT VR voltage
5	GND	-	GND
<b>CN4 (to AF/SQL VR)</b>			
1	5V	O	5V
2	NC	-	NC
3	SQL	I	SQL VR voltage
4	AFVL	I	AF VR voltage
5	GND	-	GND
<b>CN5 (to Main encoder)</b>			
1	5V	O	5V
2	MEN1	I	Main encoder pulse1
3	MEN2	I	Main encoder pulse2
4	GND	-	GND

### DISPLAY(AF/SQL VR) UNIT (X54-341 B/3)

Pin No.	Name	I/O	Function
<b>CN7 (to DISPLAY unit A/3)</b>			
1	5V	I	5V
2	NC	-	NC
3	SQL	O	SQL VR voltage
4	AFVL	O	AF VR voltage
5	GND	-	GND

### DISPLAY(MULTI/IF SHIFT VR) UNIT (X54-341 C/3)

Pin No.	Name	I/O	Function
<b>CN6 (to DISPLAY unit A/3)</b>			
1	5V	I	5V
2	MUL2	O	Multi encoder pulse2
3	MUL1	O	Multi encoder pulse1
4	IFVL	O	IF SHIFT VR voltage
5	GND	-	GND

### TX-RX UNIT (X57-663 A/2)

Pin No.	Name	I/O	Function
<b>CN359 (to FINAL unit A/3)</b>			
1	GND	-	GND
2	FANH	O	FAN high speed
3	FANL	O	FAN low speed
4	IC1+	I	Current detection 1 positive

Pin No.	Name	I/O	Function
5	IC1-	I	Current detection 1 negative
6	TH1	I	Thermal protect detection voltage 1
7	PSC1	O	Power supply SW control signal 1
8	FEN1	O	Enable for internal AT circuit (100W only)
9	DATA	O	Data (100W only)
10	CLK	O	Clock (100W only)
11	VDT2	I	2nd power supply detection (200W only)
12	ODP	I	Over drive protection detection voltage (200W only)
13	TXB	O	TX 8V
14	TH2	I	Thermal protect detection voltage 2 (200W only)
15	IC2-	I	Current detection 2 negative (200W only)
16	IC2+	I	Current detection 2 positive (200W only)
17	ATL5	O	AT 5MHz relay switch (100W)
	PSC2	O	Power supply relay control 2 (200W)
18	ATEN	O	Enable for internal AT circuit (100W only)
<b>CN369 (to FINAL unit A/3)</b>			
1	14V	I	Non switched 14V
2	14AF	I	Power supply for audio IC
3	14AG	-	GND for audio IC
4	14S	I	Switched 14V
5	5V	I	Non switched 5V
6	8C	I	Switched common 8V
7	GND	-	GND
8	GND	-	GND
<b>CN375 (to FINAL (ANT) unit C/3)</b>			
1	5C	O	Switched common 5V
2	14S	O	Switched 14V
3	DATA	O	Serial data
4	CLK	O	Serial clock
5	FEN2	O	Enable for Final (ANT) unit (C/3)
6	GND	-	GND
7	AMD	I	Amplitude comparison detection voltage (100W)
		-	GND (200W)
8	PHD	I	Phase comparison detection voltage (100W)
		-	GND (200W)
9	VSF	I	Forward wave detection voltage
10	VSR	I	Reflected wave detection voltage
11	TXB	O	TX 8V
12	GND	-	GND

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## TERMINAL FUNCTION

Pin No.	Name	I/O	Function
<b>CN382 (to Connector for AT)</b>			
1	TT	I/O	External antenna tuner control
2	TS	I/O	External antenna tuner control
3	GND	-	GND
<b>CN390 (to VGS-1)</b>			
1	BUSY	I	BUSY
2	PLAY	O	PLAY
3	SO	I	Serial data for VGS-1 input
4	SI	O	Serial data for VGS-1 output
5	CLK	O	VGS-1 clock
6	EN	O	Enable for VGS-1 output
7	USEL	-	NC
8	RST	O	VGS-1 reset signal
9	DGND	-	DigitalL GND
10	AGND	-	Analog GND
11	AO	I	Audio input
12	AI	O	Audio output
13	AGND	-	Analog GND
14	5C	O	Switched common 5V
15	NC	-	NC
16	NC	-	NC
17	NC	-	NC
18	NC	-	NC
19	NC	-	NC
20	NC	-	NC
21	NC	-	NC
22	NC	-	NC
23	NC	-	NC
24	NC	-	NC
<b>CN403 (to RF unit)</b>			
1	GND	-	GND
2	KEY	O	KEY down signal
3	DASH	O	Electronic keyer dash signal
4	DOT	O	Electronic keyer dot signal
5	KYS	O	KEY jack judgement signal
6	AGC	O	Automatic gain control voltage
7	CKYS	O	CKY mute signal
8	PGC	O	Power gain control voltage
9	PRES	O	Pre-AMP switching signal
10	DATA	O	Data

Pin No.	Name	I/O	Function
11	CLK	O	Clock
12	REN	O	Enable signal for RF unit
13	3C	O	Switched common 3V
14	8C	O	Switched common 8V
15	14S	O	Switched 14V
16	RXB	O	RX 8V
17	TXB	O	TX 8V
18	GND	-	GND
<b>CN554 (to TX-RX (OP FILTER/TCXO) unit B/2)</b>			
1	FIL1	I	Option filter recognition signal
2	FIL2	I	Option filter recognition signal
3	BLNK	O	IF-AMP mute signal
4	AGC	O	AGC voltage
5	IFGC	O	IF gain cntrol voltage
6	RXB	O	RX 8V
7	TXB	O	TX 8V
8	8C	O	Switched common 8V
9	GND	-	GND
10	IFIN	I/O	10.695MHz IF input/output
<b>CN555 (to TX-RX (OP FILTER/TCXO) unit B/2)</b>			
1	RXOUT	I	10.695MHz IF input (RX)
2	FMIF	I	IF input (FM-RX)
3	RXB	O	RX 8V
4	FILT4	O	BPF selection signal
5	FILT3	O	BPF selection signal
6	FILT2	O	BPF selection signal
7	FILT1	O	BPF selection signal
8	TXIN	O	10.695MHz IF output (TX)
9	FILT5	O	BPF selection signal
10	5C	O	Switched common 5V
11	GND	-	GND
12	15.6M	I	Option TCXO 15.6MHz reference input
<b>J131 (REMOTE)</b>			
1	SPO	O	Speaker output
2	COM		Common terminal (relay)
3	SS	O	Standby switch
4	MKE		Make terminal (relay)
5	BRK		Break terminal (relay)
6	ALC	I	ALC voltage
7	RL	O	TX 12V

# TS-480HX/480SAT

## TERMINAL FUNCTION

Pin No.	Name	I/O	Function
8	RTK	I	RTTY control
9	GND	-	GND
<b>J132 (DATA)</b>			
1	ANI	I	Packet data input
2	GND	-	GND
3	DTS	I	Packet standby switch
4	NC	-	NC
5	ANO	O	1200bps RX output
6	SQC	O	SQL control voltage output
7	GND	-	GND
<b>J201 (COM)</b>			
1	NC	-	NC
2	RXD	O	Data output
3	TXD	I	Data input
4	NC	-	NC
5	GND	-	GND
6	NC	-	NC
7	RTS	I	Request to send signal
8	CTS	O	Clear to send signal
9	NC	-	NC
<b>J202 (to DISPLAY unit A/3)</b>			
1	SP	O	Speaker output
2	TDO	I	Serial data input
3	RDO	O	Serial data output
4	GND	-	GND
5	8M	O	8V
6	SPG	-	Speaker GND
<b>J351 (MIC)</b>			
1	MU	I	MIC up signal
2	8C	O	Switched common 8V
3	MCG	-	GND
4	SS	I	Standby switch
5	MSG	-	MIC GND
6	MIC	I	MIC signal output
7	NC	-	NC
8	MD	I	MIC down signal

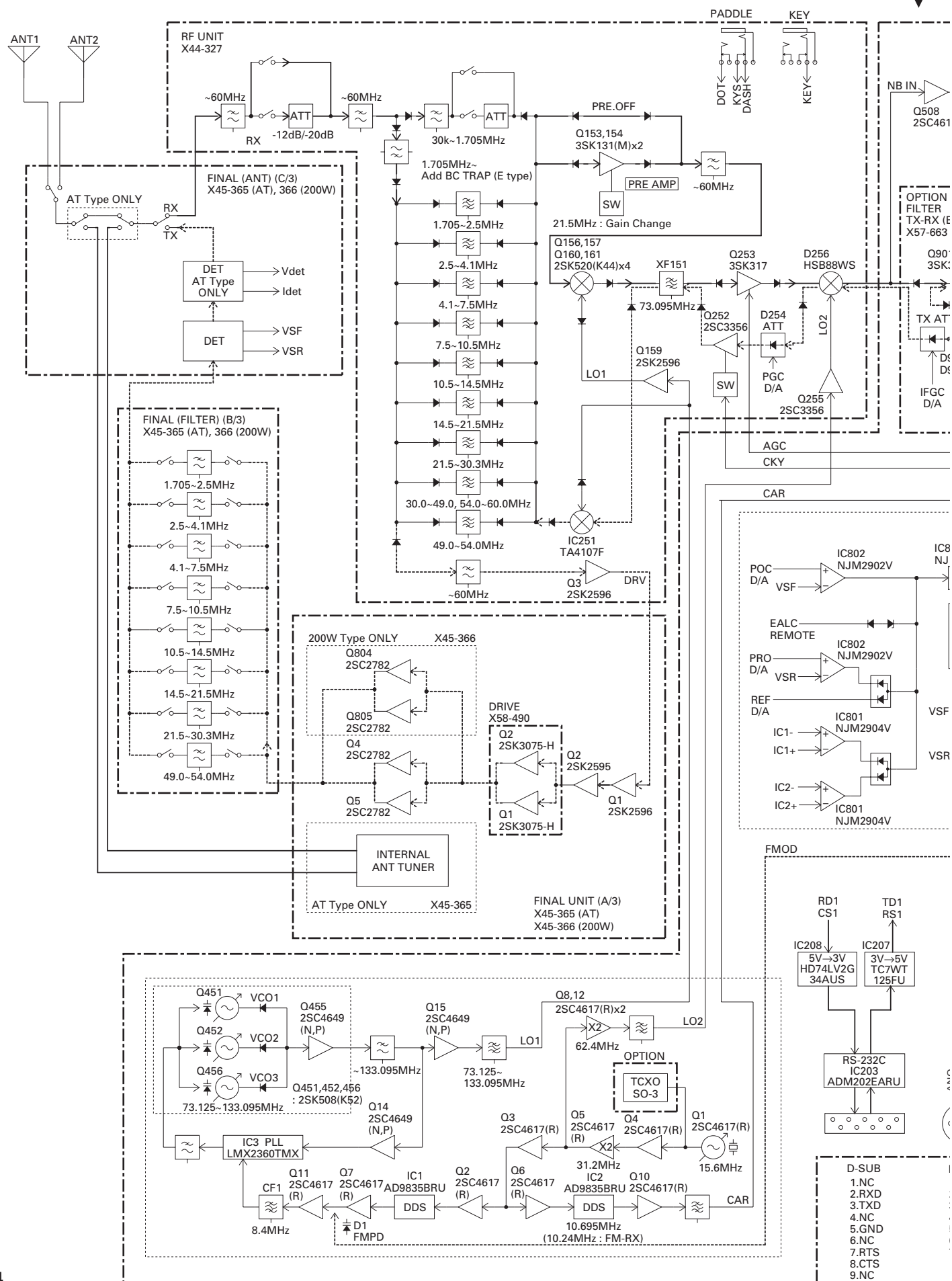
### TX-RX (OP FILTER/TCXO) UNIT(X57-663 B/2)

Pin No.	Name	I/O	Function
<b>CN901 (to TX-RX unit A/2)</b>			
1	FIL1	O	Option filter recognition signal
2	FIL2	O	Option filter recognition signal
3	BLNK	I	IF-AMP mute signal
4	AGC	I	AGC voltage
5	IFGC	I	IF gain cntrol voltage
6	RXB	I	RX 8V
7	TXB	I	TX 8V
8	8C	I	Switched common 8V
9	GND	-	GND
10	IFIN	I/O	10.695MHz IF input/output
<b>CN971 (to TX-RX unit A/2)</b>			
1	RXOUT	O	10.695MHz IF output (RX)
2	FMIF	O	IF output (FM-RX)
3	RXB	I	RX 8V
4	FILT4	I	BPF selection signal
5	FILT3	I	BPF selection signal
6	FILT2	I	BPF selection signal
7	FILT1	I	BPF selection signal
8	TXIN	I	10.695MHz IF input (TX)
9	FILT5	I	BPF selection signal
10	I5C	I	Switched common 5V
11	GND	-	GND
12	15.6M	O	Option TCXO 15.6MHz reference output

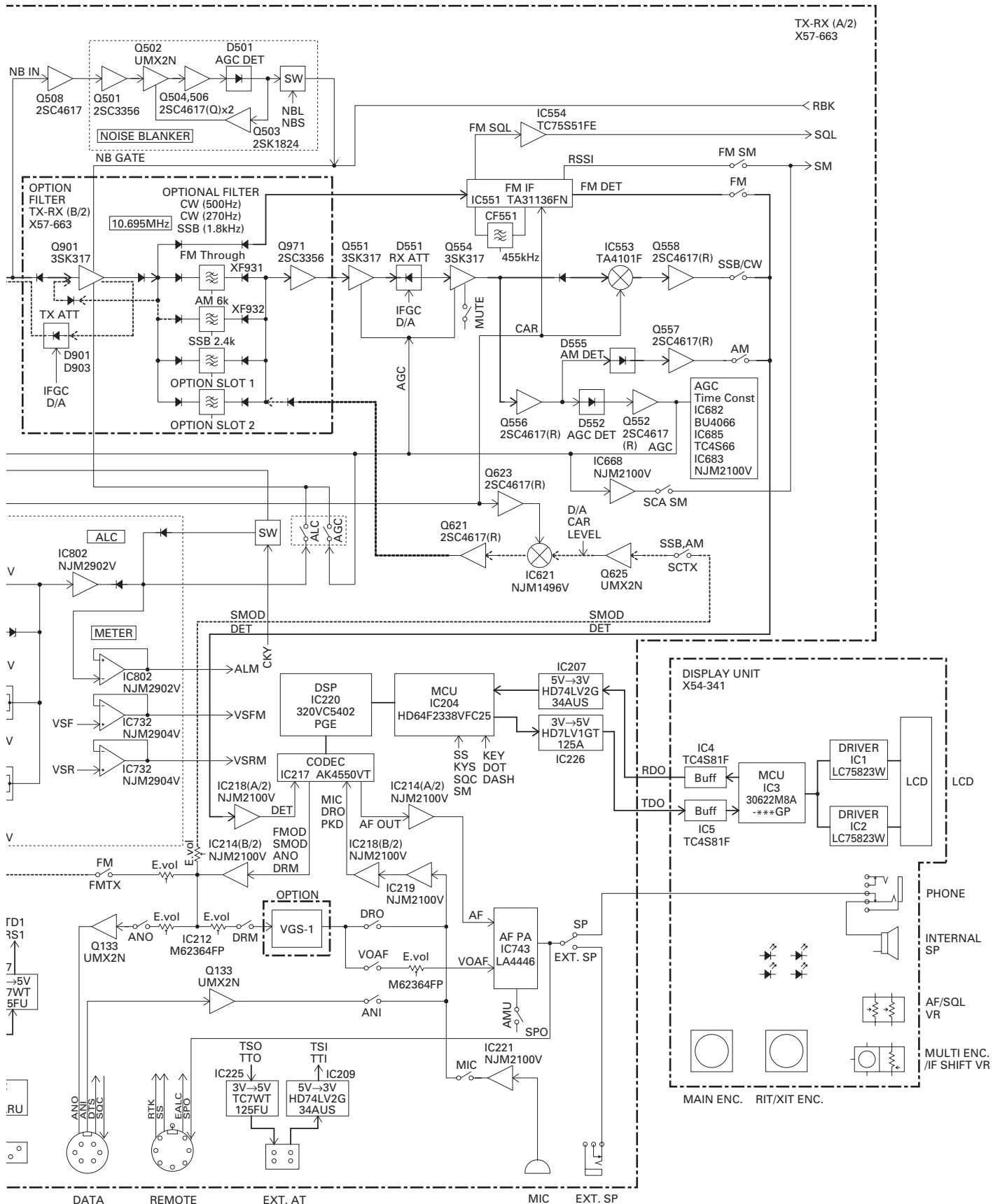
### SUB UNIT (X58-490)

Pin No.	Name	I/O	Function
<b>- (to FINAL unit A/3)</b>			
1	DIN1	I	Drive input 1
2	GND	-	GND
3	BIN	I	Bias input
4	GND	-	GND
5	DIN2	I	Drive input 2
<b>- (to FINAL unit A/3)</b>			
1	DOUT2	O	Drive output 2
2	GND	-	GND
3	GND	-	GND
4	DOUT1	O	Drive output 1

# TS-480HX/480SAT BLOCK DIAGRAM



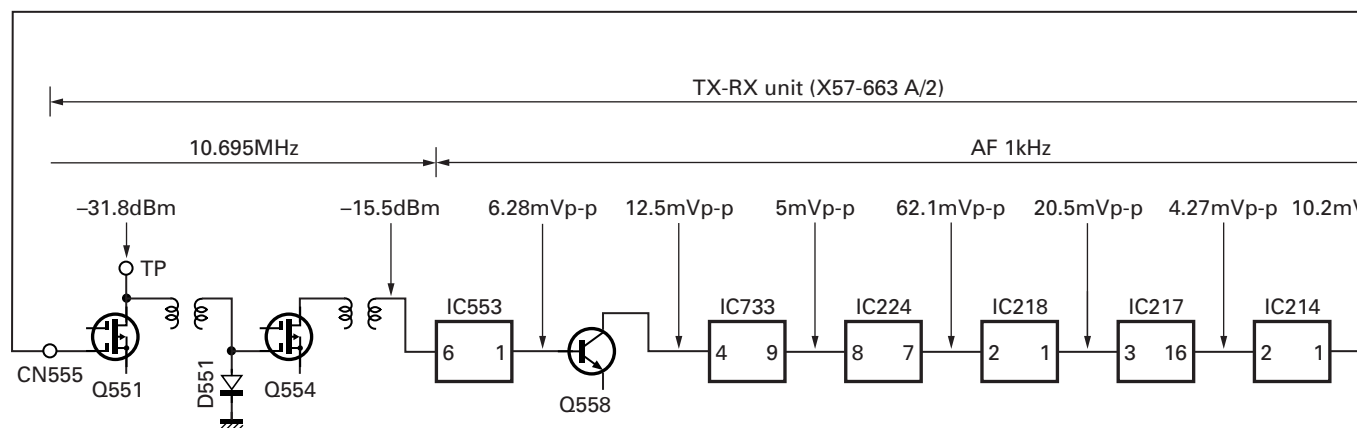
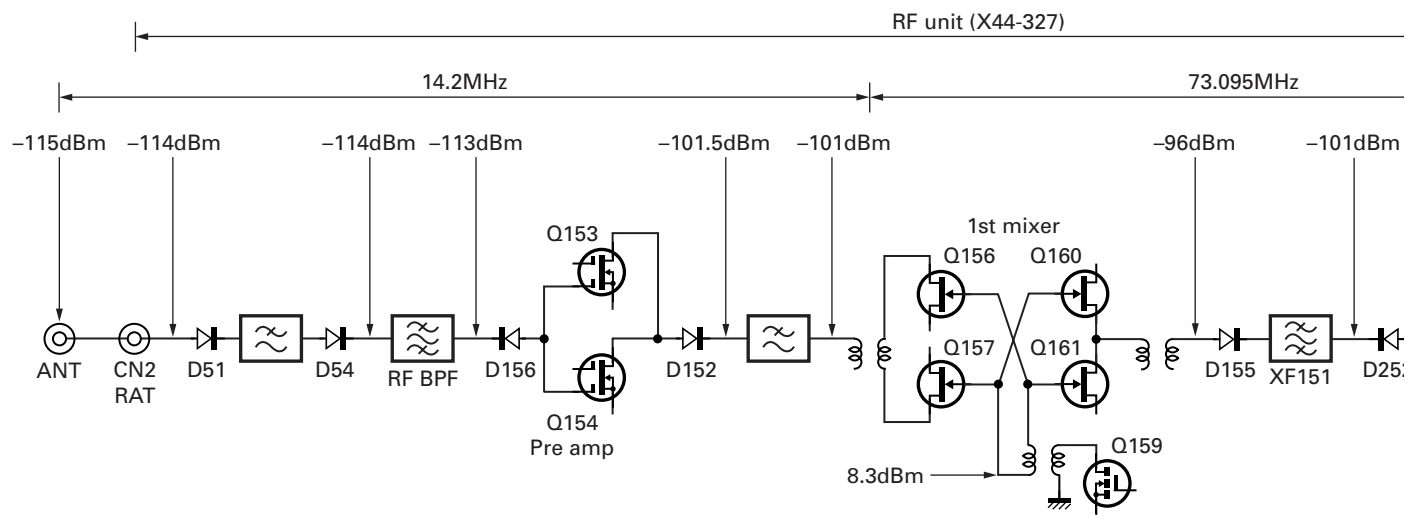
# BLOCK DIAGRAM TS-480HX/480SAT





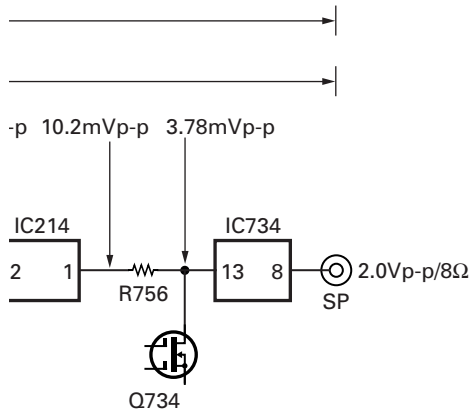
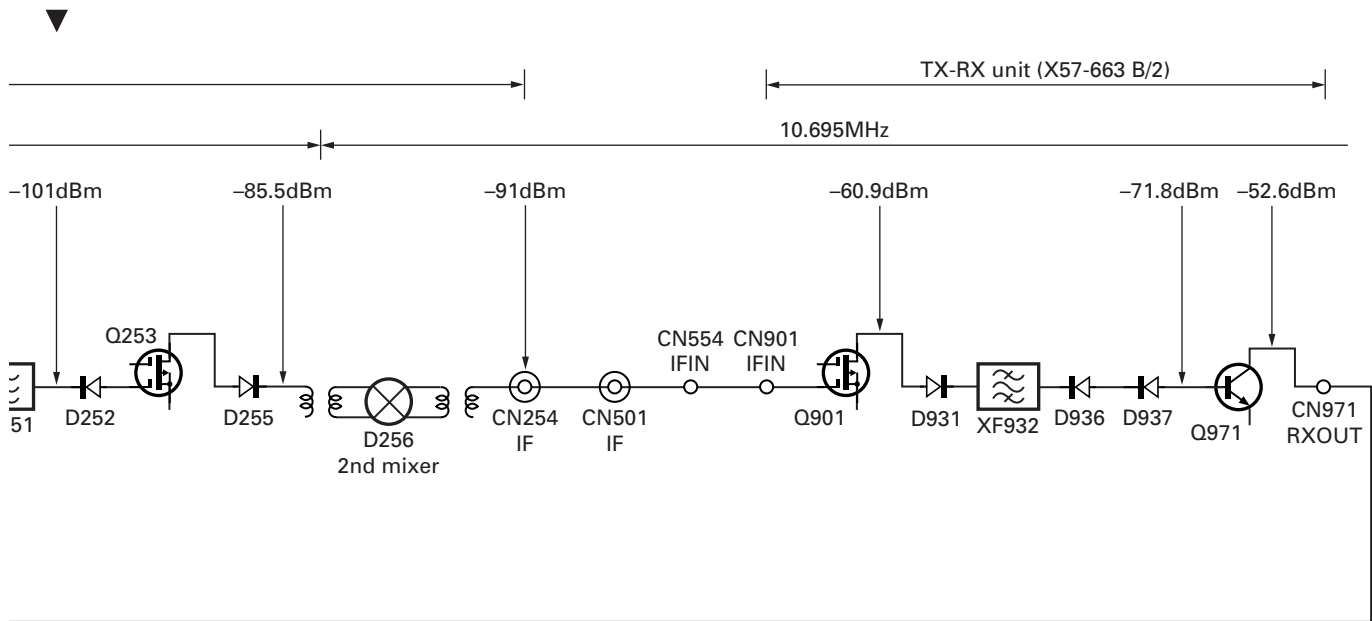
# TS-480HX/480SAT

## LEVEL DIAGRAM (RX SECTION)



# TS-480HX/480SAT

## LEVEL DIAGRAM (RX SECTION)



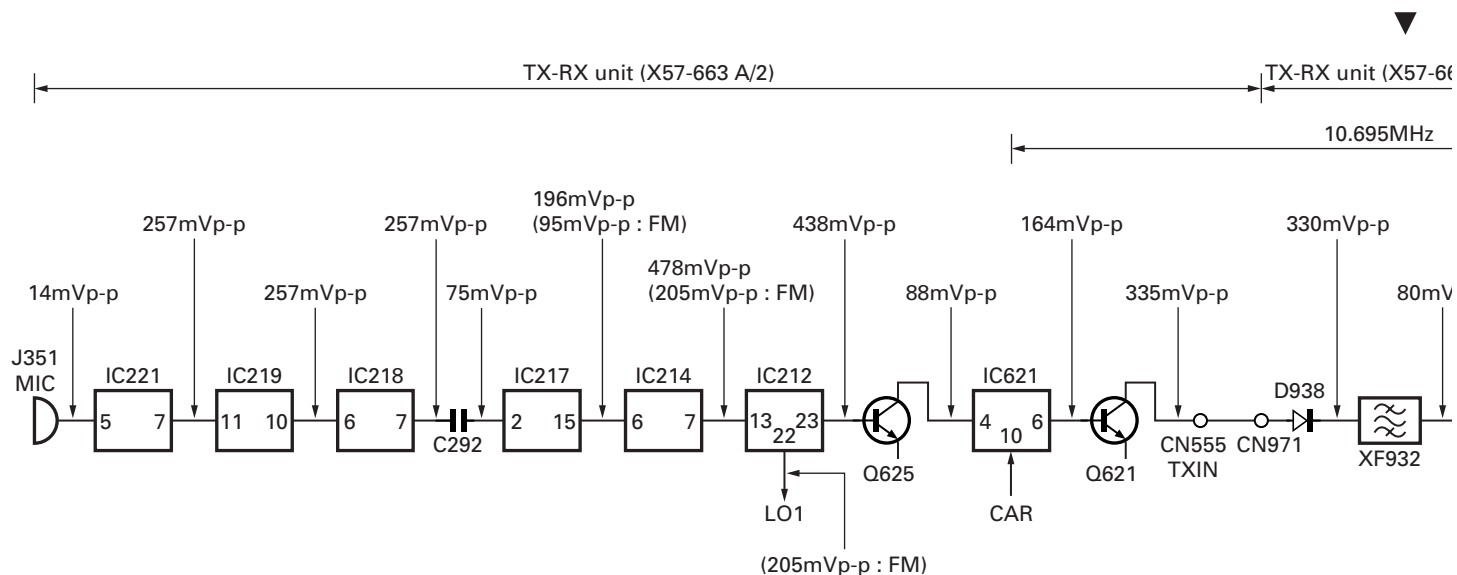
### Measurement condition

Frequency : 14.2MHz  
 PRE AMP : ON  
 ANT input : -113dBm/0.501μV  
 AF output : 0.63V/8Ω, 1kHz  
 Mode : USB

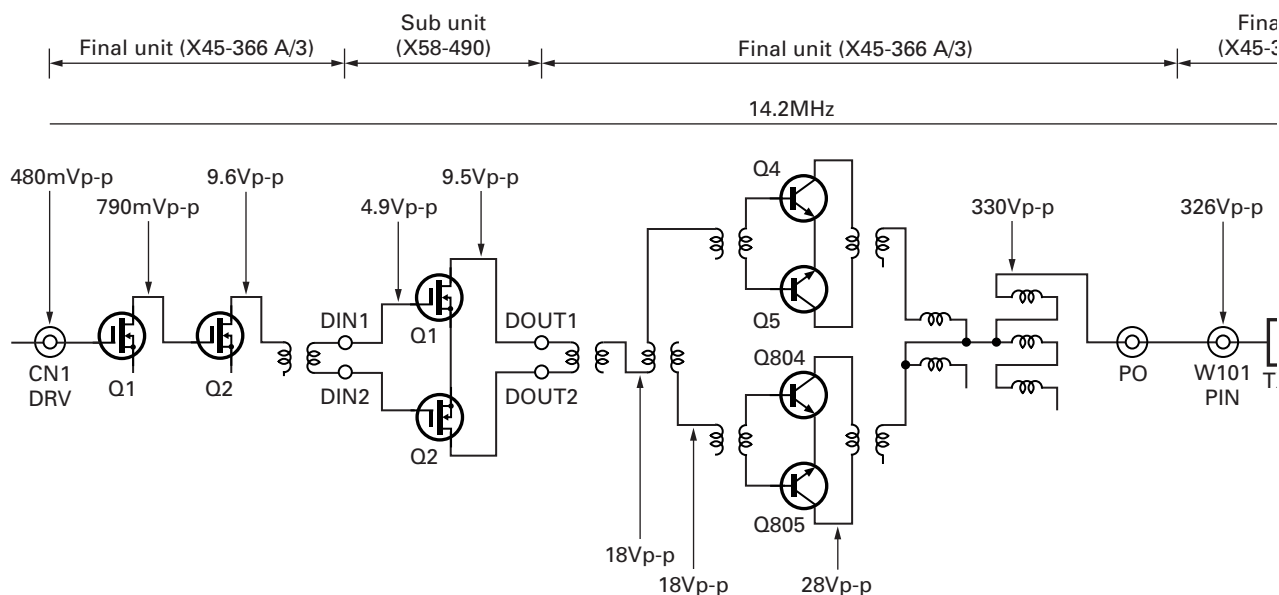
Input -113dBm from the antenna, set AF VR so that AF output is 0.63V, and measure the signal level at each part.  
 The AF section is measured with an oscilloscope and the other parts are measured with an RF voltmeter.

# TS-480HX/480SAT

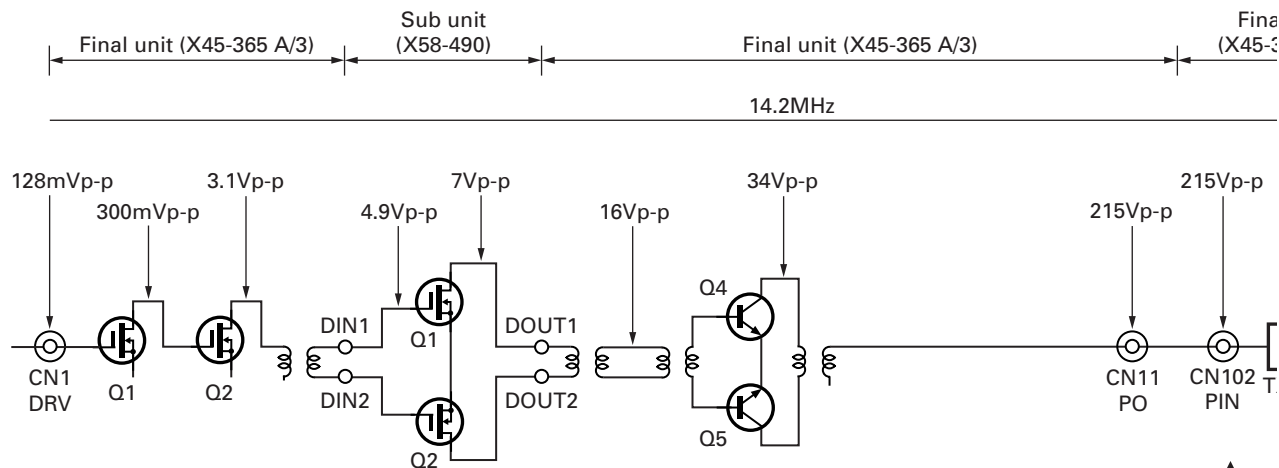
## LEVEL DIAGRAM (TX SECTION)



### TS-480HX

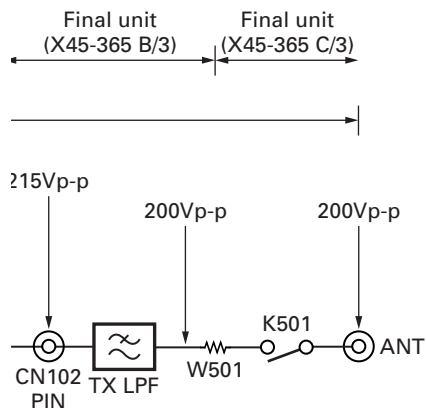
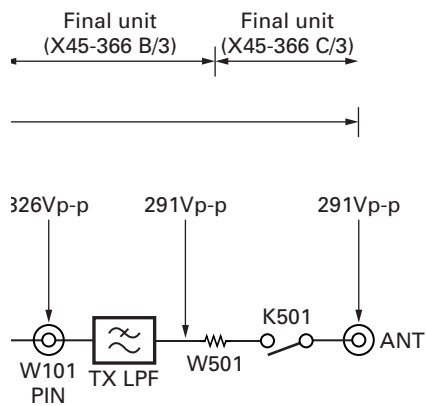
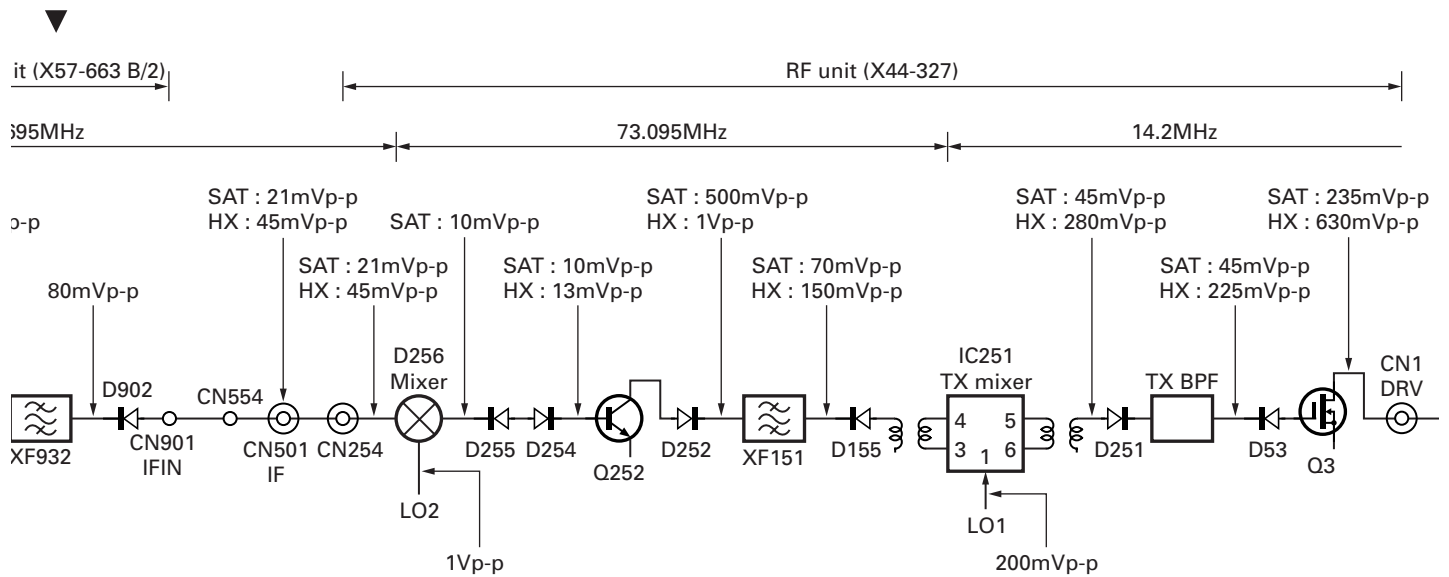


### TS-480SAT



# TS-480HX/480SAT

## LEVEL DIAGRAM (TX SECTION)



### Measurement condition

Frequency : 14.2MHz

Mode : USB

The values in parentheses ( ) are those in FM mode.

MIC input : 1kHz/5mV

Output power : 100W (TS-480SAT), 200W (TS-480HX)

MIC level : ALC zone maximum

Measure the voltage using the oscilloscope.

# TS-480HX/480SAT

## ACCESSORIES

**PG-20 (DC Cable : 7m)**



**YF-107C (500Hz CW Filter)**



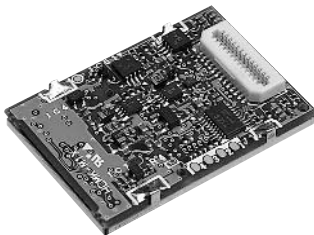
**PG-4Z (Extension Cable Kit)**



**YF-107CN (270Hz CW Narrow Filter)**



**VGS-1 (Voice Guide & Storage Unit)**



**YF-107SN (1.8kHz SSB Narrow Filter)**



**SO-3 (TCXO Unit)**



**ARCP-480 (Radio Control Program)**

**ARHP-10 (Radio Host Program)**

Available free for downloading from the KENWOOD website:  
<http://www.kenwood.com/i/products/info/amateur.html>

# TS-480HX/480SAT

## SPECIFICATIONS

### General

Mode .....	J3E (LSB, USB) / A1A(CW) / A3E (AM) / F3E (FM) / F1B (FSK)
Number of memory channels .....	100 + 10 (Quick memory channels)
Antenna impedance	
160m~6m band .....	50Ω (with built-in antenna tuner 16.7~150Ω) (SAT) 50Ω (HX)
Supply Voltage .....	DC 13.8V ±15% (TS-480HX : Voltage difference between DC1 and DC2 is within 1V.)
Grounding method .....	Negative ground
Current	
Transmit (max.) .....	20.5 A or less (SAT) 41.0 A or less (HX)
Receive (no signal) .....	1.5 A or less
Usable temperature range .....	-20°C~60°C (-4°F~140°F)
Frequency stability without SO-3	
-10°C~50°C .....	Within ±5ppm
-20°C~60°C .....	Within ±10ppm
Frequency stability with SO-3	
-10°C~50°C .....	Within ±0.5ppm
-20°C~60°C .....	Within ±1.0ppm
Dimensions (W x H x D Projections included)	
TX / RX unit .....	179 x 69.5 x 278 mm / 7 x 2-3/4 x 10-15/16 inches
Remote Control panel .....	183 x 78 x 68 mm / 7-3/16 x 3 x 2-5/8 inches
Weight	
TX / RX unit .....	Approx. 3.2kg / 7 lbs
Remote Control panel .....	Approx. 0.5kg / 1 lb 2 oz

### Transmitter

Frequency range	
160m band .....	1.8~2.0MHz (K-type) 1.81~2.0MHz (E-type)
80m band .....	3.5~4.0MHz (K-type) 3.5~3.8MHz (E-type)
60m band .....	5.25~5.45MHz (K-type)
40m band .....	7.0~7.3MHz (K-type) 7.0~7.1MHz (E-type)
30m band .....	10.1~10.15MHz
20m band .....	14.0~14.35MHz
17m band .....	18.068~18.168MHz
15m band .....	21.0~21.45MHz
12m band .....	24.89~24.99MHz
10m band .....	28.0~29.7MHz
6m band .....	50.0~54.0MHz (K-type) 50.0~52.0MHz (E-type)
Output power	
SSB / CW / FSK / FM .....	Max. 100W (160m~6m band) (SAT) 200W (160m~10m band) (HX) 100W (6m band) (HX)
	Min. 5W (160m~6m band) (SAT) 5W (160m~6m band) (HX)
AM .....	Max. 25W (160m~6m band) (SAT) 50W (160m~10m band) (HX) 25W (6m band) (HX)
	Min. 5W (160m~6m band) (SAT) 5W (160m~6m band) (HX)
Modulation	
SSB .....	Balanced
FM .....	Phase
AM .....	Low power
Spurious emissions	
160m~10m band .....	-50dB or less
6m band .....	-60dB or less
Carrier suppression (SSB) .....	40dB or more
Unwanted sideband suppression (modulation frequency 1.0kHz) .....	40dB or more
Maximum frequency deviation (FM)	
Wide .....	±5kHz or less
Narrow .....	±2.5kHz or less
Transmit frequency response .....	400~2600Hz (Within -6dB)
XIT shift frequency range .....	±9.99kHz
Microphone impedance .....	600Ω



# TS-480HX/480SAT

## SPECIFICATIONS

### Receiver

Circuit type .....	SSB / CW / AM / FSK : Double conversion superheterodyne FM : Triple conversion superheterodyne
Frequency range ( ) : VFO coverage range .....	0.5~30MHz, 50~54MHz (0.03~60MHz)
Intermediate Frequency (IF) .....	1st IF : 73.095MHz 2nd IF : 10.695MHz 3rd IF (FM only) : 455kHz
Sensitivity	
SSB / CW / FSK (S/N 10dB) .....	0.5~1.705MHz : 4μV or less 1.705~24.5MHz : 0.2μV or less 24.5~30.0MHz : 0.13μV or less 50.0~54.0MHz : 0.13μV or less
AM (S/N 10dB) .....	0.5~1.705MHz : 31.6μV or less 1.705~24.5MHz : 2.0μV or less 24.5~30.0MHz : 1.3μV or less 50.0~54.0MHz : 1.3μV or less
FM (12dB SINAD) .....	28.0~30.0MHz : 0.22μV or less 50.0~54.0MHz : 0.22μV or less
Selectivity	
SSB .....	-6dB : 2.4kHz or more, -60dB : 4.4kHz or less
AM .....	-6dB : 5.0kHz or more, -60dB : 40.0kHz or less
FM .....	-6dB : 12.0kHz or more, -50dB : 25.0kHz or less
Image rejection .....	70dB or more
1st IF rejection .....	70dB or more
Beat Cancel attenuation (at 1kHz) .....	40dB or more
RIT shift frequency range .....	±9.99kHz
Squelch sensitivity	
SSB / CW / FSK / AM .....	0.5~1.705MHz : 18.0μV or less 1.8~30.0MHz : 1.8μV or less 50.0~54.0MHz : 1.1μV or less
FM .....	28.0~30.0MHz : 0.2μV or less 50.0~54.0MHz : 0.2μV or less
Audio output (8Ω, 10% distortion) .....	2.0W or more
Audio output impedance (EXT. SP) .....	8Ω

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